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Attention has been drawn to the observation that environmental benefits under the current regulatory approaches are diminishing with respect to increased pollution control costs. Regulators have begun to appreciate that while environmental gains can still be achieved under the current command and control system, the most significant environmental gains have already been made, and an alternative regulatory approach might be warranted for continued environmental improvement. This study found that regulatory initiatives that seek to address business incentives and disincentives may yield better environmental outcomes.

Internal characteristics such as corporate environmental directives, waste audit and environmental performance tracking systems and linkage of compensation to environmental performance are evident in firms that have attempted to adapt to regulatory pressures. These characteristics, according to organizational models, are posited to

improve the environmental performance of firms as environmental issues are linked to key business decisions.

This study was conducted by surveying firms in the forest products industry. Certain firms were found to exhibit specific internal characteristics indicative of good environmental performance. The study attempts to identify the implication this finding has on regulators in terms of policy design and implementation.

The study suggests that the optimum regulatory strategy is a hybrid of a command and control approach and a market-based approach which blends the compliance assurance of the command and control approach to address motivating firm behavior with the flexibility of the market-based approach to provide firms incentives to improve environmental performance.

The study concludes that the value of such a hybrid approach which attempts to address firm incentives and disincentives related to their environmental practices will result in improved environmental performance.

Environmental Regulations Reconsidered: Identifying Incentives and Barriers to Environmental Performance

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Kathleen D. Craig

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TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

LIST OF APPENDIX TABLES

Environmental Regulations Reconsidered: Identifying Incentives and Barriers to Environmental Performance

Introduction

Environmental regulation of industrial sources of pollutants for the past two decades has potentially reached a point of reduced marginal returns related to increased pollution control investments. Cairncross (1991), a market-based regulatory advocate, stated that "As environmental standards tighten, diminishing environmental returns set in." America spends over 2 percent of the gross domestic product on pollution control and the cost is rising. U.S. firms spent $115 billion dollars in 1990 complying with environmental regulations This is estimated to increase to $170-185 billion by the turn of the century (US EPA, 1990).

Past U.S. environmental regulation has typically taken a broad, command-and-control tack - - a one-size-fits-all approach characterized by prescriptive features and end-of-pipe technology. This philosophy had little regard to organizational differences, much less different firm incentives and disincentives related to compliance. While this broad, prescriptive approach represented a rational response to the national environmental crisis of the 1960s, the approach may have outlived its usefulness. This command-and-control approach was highly successful in achieving significant environmental gains, and will continue to play a

major role in any environmental regulatory program. However, future environmental regulatory strategies may need to evolve through alternative approaches.

Environmental regulations seek to change organizational behavior. The key to inducing any change in organizations is to identify forces that motivate such changes in behavior. The primary assertion of this research is that the development of effective environmental strategies will require greater knowledge of factors that motivate and inhibit firms to adapt to regulatory demands, and that organizations can assist environmental agencies to accomplish this objective.

The goal of this research is to recommend an alternative regulatory strategy for industrial sources of air pollution in the state of Oregon. This approach will seek to address business incentives and barriers to improve environmental performance. The recommendation is a culmination of the survey results, informal interviews and the synthesis of the related literature. The objectives of this research were to:

1. Describe an array of environmental regulatory choices;
2. Examine the research literature to determine important incentives and disincentives for firms to achieve good environmental performance, and organizational models describing how firms adapt to regulatory pressures;
3. Survey personnel at two large forest products firms to determine their opinions on the relative importance of identified environmental performance factors;

4. Interview city, state and federal environmental agency personnel, academe, industry representative and consultants to determine factors important to firms as they seek to adapt to external pressures;
5. Provide results and conclusions of company surveys; and
6. Recommend an alternative regulatory approach for industrial sources of air pollution which seeks to address business incentives and disincentives to improve environmental performance.

Literature Review

Recent research in regulatory approaches and organizational theory includes an emerging sector of methodology to improve the effectiveness of environmental regulations. A major difficulty in this type of research is identifying specific variables that affect performance. Another difficulty is unpacking broad factors describing organizational behavior. Many factors drive behavior and a clear cut causal relationship between performance and regulatory approaches has proven hard to establish. In addition, adequate data are typically absent. Environmental agencies do not routinely collect data that are required for an integrated assessment of regulatory approaches.

Specifically related to this research, atmospheric air emissions data tend to lack both precision and accuracy. Reaching conclusions as to the effectiveness of any given regulatory approach over time in accomplishing the initial goal is especially difficult. For example, the EPA just recently attempted a self-assessment of the Clean Air Act after two decades of regulating air pollution sources at a cost to society of approximately $25 billion a year. Critics say the data are suspect and EPA overestimates the environmental gains (Crandall et al. 1996).

Much of the regulatory literature has examined organizational structures, decision making models, and strategic planning. Less has been written specifically on examining characteristics that contribute to a company's environmental performance. Even less has been written on the effect of agency-firm interaction on performance. Some of the analysis contained herein has been deduced from organizational theory

and a basic understanding of how organizations assimilate external pressures. Other conclusions have been drawn from work done on corporate social responsibility, which captures the company's commitment to societal values, environmental stewardship and production sector responsibility.

The literature review focuses on corporate responses to external pressures including environmental regulations. The review attempts to develop a linkage between organizational characteristics and environmental performance.

Environmental Regulations

The hierarchy to environmental regulations typically begins with policy as:

NATIONAL LEVEL Policy

↓

STATE LEVEL Environmental Program

↓

Waste Air Water

Hazardous Solid

↓

Regulations

Command & Control Market-based

While the State environmental agency in Oregon, Oregon Department of Environmental Quality, establishes some air quality policies, most policy is set at a national level. The state environmental agency is primarily responsible for implementing regulations, programs, special projects and initiatives to accomplish policy objectives. An example of an environmental policy might be reduction of hazardous air pollutants. There are three environmental program areas in Oregon: air quality, water quality and wastes (hazardous and solid). This study focuses on the air quality program which is directed by the Clean Air Act.

An example of regulations or standards linked to the policy of reducing hazardous air pollutants is National Emission Standards for Hazardous Air Pollutants or "NESHAP's". This regulatory "approach" is based on design standards, which are described in the following section. An example of a regulatory initiative or "tool" is technical assistance. Its relation to policy is:

Policy	Reduce hazardous air pollutants
Regulation	NESHAP
Regulatory Approach	Design standard (may be considered command and control or market-based)
Regulatory tool	Technical assistance

Most environmental regulations are either considered command and control or market-based, although there are gradations. Command and control and market-based headings refer to broad regulatory approaches which characterize the general approach of certain regulations and tools. The degree of implementation flexibility offered to firms is the distinction. Tradeoffs exist within either approach. While command and control regulations provide firms and the agency certainty

resulting from a high degree of specificity (not to be confused with regulatory clarity), choices are restricted in how firms demonstrate compliance. Market-based regulations allow firms choices in meeting environmental standards, but agency administrative costs are very high relative to command and control.

Command and Control Regulations

A command and control approach has been historically used to regulate major industrial sources of air pollution since the 1970s. Critics refer to the command and control approach as draconian. Proponents say it leaves little to doubt and provides necessary assurance of compliance. Despite the debate, significant environmental gains have been accomplished under this approach although there is considerable pressure from industry to consider alternative schemes. Command and control regulations are often heavily criticized as ignoring more cost-effective choices for controlling or preventing pollution.

"New Source Review" air quality regulations are an example of a regulation based on a command and control approach. These are some of the most stringent air quality regulations and are required of any major new source or a major modification of an existing source. These regulations are designed to either shift an area from non-attainment, or to insure continued attainment for the area. These regulations allow for industrial growth in non-attainment areas as long as new sources of air pollution "offset" their growth to insure the area does not worsen. "New Source Review" is a critical component of a state's air program because it monitors and sets minimum requirements for new sources of air pollution.

Sources subject to New Source Review in a non-attainment area must install state-of-the-art control equipment without regard to cost in order to achieve the lowest available emission rate. In addition, they have to offset their proposed increase by securing an emission reduction from an existing source in the area of the proposed increase, by an amount equal to or greater than the increase, depending on the severity of the area. Finally, these sources have to conduct an alternative analysis evaluating alternative sites, production processes, and other factors to demonstrate that the benefits of siting the proposed source in a non-attainment area significantly outweigh the environmental and social costs associated with siting the source.

One of the main problems with a command and control approach is that it fixes both outcome and process at facilities. If the regulation specifies the required technology to be applied (not all command and control regulations do), firms lose innovative opportunities, cost-effective choices, and participation in decisions that can significantly impact their business.

The following are examples of regulatory approaches and tools. All of these with the exception of technical assistance, are federally mandated. Some of these approaches may generally be considered either command and control or market-based. Some regulations may be viewed as flexible in terms of one element, such as not specifying the control technology, but inflexible in terms of other requirements such as prescriptive administrative requirements. Implementation flexibility refers not only to whether control technology requirements are specified, but to other regulatory requirements such as specifying operating

parameters, reporting, monitoring, source testing, recordkeeping and other compliance related issues.

Performance Based Standards

Performance based standards are generally considered a market-based regulation primarily because firms may choose what control technology is applied to meet the standard, which offers firms considerable flexibility. These standards specify the end result but do not specify how the end result is accomplished. However, the standard may heavily imply a certain technology (e.g. few control choices exist to meet the standard). An example of a performance based standard is "New Source Performance Standards" for municipal solid waste landfills to control their gaseous emissions. The standard is stated as "A control system designed and operated to reduce nonmethane organic compound emissions by 98 percent" (Federal Register, Vol. 61, No. 49, 1996). This regulation may give guidance on what control technologies can achieve the standard, but the landfill operator is allowed to choose a particular technology.

Performance based standards can allow companies to choose cost-effective or innovative approaches to meet emission standards.

Design Standards

Design standards apply to sources in a particular category and establish the emission reduction achievable by a "model" group comprised of the best performers in that category. These standards are prescribed by EPA to apply stringent control technology requirements.

Hazardous air pollutants are regulated under this approach. For instance, dry cleaners emitting over a certain threshold are subject to standards requiring installation of control technology known as "MACT" (Maximum Achievable Control Technology). These standards resulted from evaluating the top 12 percent of drycleaners related to reduced emissions. Sources subject to these standards may propose alternative control technologies provided equivalent emission reductions to the model group are achieved. This allows some flexibility for companies to remove barriers to comply.

Product Bans and Limitations

Another example of a regulatory approach used to control or prevent pollution is product bans and limitations. This tool either bans use or manufacture of a product, or places restrictions on its use or manufacture. A specific example is tributylin (TBT), an ingredient used in various coatings and solutions for a variety of consumer and industrial applications such as a plastics anti-yellowing agent, a slimicide in cooling towers, a biocide in "odor eaters" shoe inserts. TBT was also used in household paints for bathrooms and other areas subject to high moisture. Its most widespread use is an antifouling ingredient in marine coatings for vessel hulls and marine pilings to prevent barnacle buildup.

TBT has been found to concentrate in marine species such as shellfish, salmon and halibut, and results in significant ecological toxicity causing abnormal growth and mortality. In addition, consumers were getting sick after applying TBT-containing paints, especially in enclosed spaces such as bathrooms. Once the effects of TBT were understood, its use was banned for some applications and restricted in

others. Management practices are now required in shipyards where hulls of marine vessels are sandblasted including shrouding during sandblasting and careful storage and disposal of TBT-containing sandblast grit. TBT-containing paints were banned for household use.

Pollution Charges

This is an example of an economic incentive regulatory approach which assesses fixed and variable costs for discharges into the environment. Examples of fixed costs are base permitting fees and a fixed dollar amount for each unit of pollution. Costs for subsequent permit modifications vary depending on the complexity of the modification. The Clean Air Act requires that a state's operating permit program be fully supported by fees where states may request annual increases not to exceed the Consumer Price Index. Economists and market-based advocates such as Cairncross (1991) strongly argue in favor of economic instruments ("pay to pollute") to achieve environmental goals. Companies with financial constraints may seek lower cost options under economic instruments, but they may also be forced into noncompliance due to an inability to pay.

Market-Based Regulations

Market-based regulations are relatively new in practice, although the idea was discussed in the economics field over thirty years ago. A regulation that is market-based is emissions trading. There are two types of emissions trading: "open" and "closed". The most notable example of closed market trading is found in Los Angelos and is administered by South Coast Air Quality District which regulates the

most polluted air in the country. Their trading program, "RECLAIM", is federally mandated to ratchet down emissions of all applicable sources by establishing an annual "emissions cap" that sources may not exceed. If a source is able to reduce emissions below the cap, they may "trade" the reduction to another source who buys it to comply with RECLAIM. Depending on pollution control equipment costs, a ton of a given pollutant could run into the thousands.

The idea behind a closed market trading program is to tightly control the sources in an airshed and to ratchet air emissions down over time. Each year the cap shrinks until the ultimate future reduction goal is met. Closed market trading programs are mandatory programs for non-attainment areas struggling to achieve attainment.

The emissions trading that takes place in Oregon is under an open market system which is completely voluntary. Trades in Oregon are primarily restricted to companies needing to obtain reductions (e.g. "offsets") to satisfy one requirement, "New Source Review." For some non-attainment areas, the offset requirement is 10 percent greater than the proposed increase from the new source which should result in a net air quality benefit. This offset is purchased from an existing source who is emitting the same pollutant, under similar conditions (e.g., same stack height). Since offsets represent a monetary value, companies may be motivated to reduce emissions below regulatory requirements if offset values more than pay for the costs of such additional reductions.

Bubbling

Bubbling is a way for a firm to exceed an emissions standard of one polluting unit (e.g. under-control a boiler) as long as they over-control another polluting unit subject to the same standard, as long as the weighted average of the two units meet the standard. This allows firms to seek out cost-effective solutions to meeting emission standards. This approach offers considerable flexibility in meeting regulatory requirements, and removes financial barriers to perform; however, bubbling is restricted to certain parts of a facility based on compliance demonstration limitations.

Technical Assistance

Technical assistance is a regulatory initiative offered to regulated sources either as part of a compliance action, or non-enforcement action. Under either option, technical assistance from the agency can provide firms valuable assistance to help them comply with regulations and may include regulatory interpretation, compliance information, help in establishing waste management systems, waste minimization, waste reduction, identifying pollution prevention opportunities and calculation of emissions for reporting. Technical assistance may be done during a routine inspection by the regulatory agency, or in meetings or conversations between the agency and source, or as requested by the firm. It also can be accomplished internally by staff at the company, by consultants or attorneys, or through attendance at an organizational meeting or conference.

Technical assistance has removed many barriers to environmental performance including a poor understanding of regulatory requirements. In addition, it has aided regulatory agencies in developing a greater understanding of company's operational problems. Companies may feel more likely to discuss an upcoming project and corresponding regulatory implications under conditions of having an established relationship with the agency. An ongoing dialogue between the company and the regulatory agency has been cited as one of the most important components to environmental performance. Technical assistance can be a very powerful tool which can establish a crucial link between firm and agency, solve misunderstandings about regulatory requirements and may help to develop a cooperative relationship to further environmental performance.

All regulatory instruments have strengths and weaknesses that involve tradeoffs. Many of the tradeoffs are related to the resources necessary for firm and agency to implement the regulation. Emissions trading for instance provides an economic incentive for sources to reduce emissions below regulatory requirements. However, it has high agency administrative costs, which include EPA oversight for approval of each individual trade.

There is no perfect regulatory instrument to solve all problems of ease of implementation, how it affects innovation, administrative costs and impact to the environment. As environmental agencies consider the mix of regulatory instruments to accomplish federal mandates and policy requirements, they need to understand how firms respond to regulatory approaches, what internal incentives and external motivators exist in

order to attempt to seek to address these factors in developing a regulatory approach that yields improved environmental outcomes.

Understanding Corporate Response to Environmental Regulatory Pressures

Environmental issues reach every facet of business. What once was reserved for legal and engineering departments, now affects every aspect of production and planning including: human resources (risk exposure), operations (emissions), research and development, marketing and strategic positioning. Post (1991) stated that strategic and operational decisions are affected on a daily basis: "How a firm fuels its fleet of cars and trucks, designs energy efficiency into a facility, organizes employee transportation and communicates about all of this to communities and government officials affects its environmental profile." Post argued that the commitment to be environmentally responsible cannot be met without addressing all of these elements of corporate activity.

Most organizational models that seek to explain how firms respond to external pressures describe an adaptation to the pressure that progresses along a continuum. Post and Altman (1992), Little (1989), Hunt and Aster (1990) and Schot (1991) all described firms as moving through phases related to environmental management. The beginning phases are mostly reactionary with little environmental planning. In later stages management becomes fully integrated. Before 1989, Little (1989) found only 10-15 percent of firms in the first and last phases. Hunt and Aster (1990) found that most firms were still in a reactive

mode, with just a few firms in the proactive, or later phase. All of the studies concluded that most firms are in transition between different phases with a general trend from reactive toward proactive environmental management.

Post and Altman's (1992) "Corporate Greening Model" described different levels of response to environmental pressures according to where a firm is in the continuum of environmental management. In the first phase, "Adjustment", Post and Altman described companies as being in a "wait and see" mode where environmental practices are modified on an "as-needed" basis. This process is described as one of recognition, and not necessarily acceptance of the environmental pressure. Changes that take place in this phase, are in response to mounting regulatory and/or market pressures.

This observation is confirmed by Hauth (1990) who found that a particular firm had been cited numerous times for permit violations. In one year alone the wastewater quality permit was violated eight times. The number of violations dropped to two the year the company was acquired by a new owner, and to zero in subsequent years. The change in behavior was interpreted as a shift away from a reactive compliance mode.

Post and Altman (1992) contended that most companies in this phase have not seriously re-evaluated their environmental goals with other management components. Environmental staff in these companies, according to their model, remain very technically focused on regulatory compliance and are not linked with strategic business goals. They suggested the role of corporate leadership is significant in both

triggering the greening process and in stimulating the company to go beyond "incremental" adjustments.

In an early work, Lund (1974) found only 40 percent of companies had written environmental policies. This would concur with Post and Altman's Corporate Greening Model which concluded these companies, newly responding to environmental pressures, were in the reactive phase, with nonexistent or newly developing environmental management structures.

In the second phase, of "Adaptive", Post and Altman described firms as starting to seriously consider their environmental values and to link those values to other parts of the firm. Firms began to go beyond strict regulatory compliance to some monitoring of future trends, especially as related to the customer base. The final phase of "Innovation" involves a rare set of companies where environmental management is institutionalized throughout the organization. Post and Altman stated that a link between environmental policies, programs and staff and all aspects of operations and strategic planning are observed in this phase.

After studying companies over several years, Post and Altman (1992) determined that environmental performance improved as companies more fully integrated environmental issues into key business operations. They found a correlation between high environmental performance and firms in the "Innovative" phase. In categorizing many companies, they found several in the "Adaptive" phase as also having achieved significantly high levels of environmental performance.

However, they consistently found none of the high performers were in the "Adjustment", or first phase.

Chaganti and Phatak (1983) described work by Chandler (1962), Scott, Salter and Berg (1970) which confirmed Post and Altman's (1995) findings that companies develop through stages. Their reports show that organizational structure follows the strategy of the firm and organizations tend to move from one stage to another in response to pressures such as higher costs and inefficiencies. Changanti and Phatak suggest that the idea of the "'stages" offers a framework for predicting the characteristics of a corporation at each stage and the expected pattern of evolution, which could be useful to regulators as they begin to question what regulatory approaches will yield the most effective outcomes.

Dillon and Fischer (1992) explained corporate behavior in terms of a mix of internal and external factors. Their research yielded some positive characteristics between certain internal factors and environmental performance. These factors included integration of environmental activities with production responsibilities at the facility level, facility managers assigned environmental responsibilities, existence of a written corporate environmental policy, a long-term environmental planning process, and incorporation of environmental factors into standard operation procedures.

A firm's corporate culture has often been overlooked in terms of its impact on performance. Yet a firm's culture is its basic "personality" (Johnson, 1997). Johnson argued this personality creates the attitudes about most of what is important to the firm. He stated that a firm's culture is a reflection of its CEO and senior management and believed

that the firm's culture can provide a fairly vivid image of what senior management models as its business ethos. Johnson stressed the significant impact corporate culture has on attitudes of its members which subsequently affects behavior and business results. Dillon and Fischer (1992) also found company values affected environmental performance, along with strong leadership, financial considerations, regulatory requirements, environmental disasters, and concern for reputation.

Power of the Public: Incentive to Change Firm Behavior

The effect of public scrutiny on the environmental behavior of firms has been studied extensively. President Clinton and Vice President Gore continually stressed the power of information in their "Reinventing Environmental Regulation" report in bringing about significant changes in environmental quality (1995). One of their highest priority items was to develop a public access program that would make all EPA data and publications available electronically and to develop a new center for environmental information and statistics to insure data are available to the public. Zimmer, U.S. Representative from New Jersey, concurred and urged Congress to pass legislation requiring these disclosures. He recognized such databases are costly, but maintained that experience has shown that unnecessary environmental regulations are more costly (Environment Strategy America, 1996).

Despite the difficulty in quantifying a firm's reputation capital, the effects of ignoring the public are measurable and can be enormous. Becker and Penny (1996), described a case of the devasting effect of negative media coverage on a proposed project for a wastewater utility.

The utility developed serious negative community relations when one of its contractors received negative publicity in a nearby town. The incident eventually ended in erosion of public support for the project with the utility spending hundreds of thousands of dollars trying to restore its public image. This study points out not only the crippling effect negative media reports can have on a company, but the spillover effect of negative publicity. In the case reported by Becker and Penny, the utility was found guilty by association, since the contractor was the most visible performer in the utility project. The utility was unable to disassociate itself from the contractor's bad reputation because of its lack of vigilance in initiating and maintaining responsibility for the project.

Becker and Penny (1996) maintained that firms engaged in environmentally sensitive areas cannot afford to overlook involvement of the public early and continuously. Becker and Penny asserted that resolving community problems after they have surfaced may cost the organization more money and time than preventing them in the first place. If left unattended, they argued, the problems can cost the organization its reputation.

Firms with multiple facilities understand this spillover or "additive" effect of bad publicity at one facility in changing the reputation of the entire company. Such effects can occur regardless of individual performance records at each of the facilities. Public perception is often based not on individual sites, but on the entire entity. A reported "plume" at one facility can mar the overall reputation of all of the firm's facilities. Firms then, are faced with the goal of consistent environmental records as one facility shifts the "performance bar" for each of the other facilities. This phenomenon is seen across firms in the same industrial

sector. One firm's bad environmental record can affect similar firms in the same category, which can create pressure within the industry to apply consistent environmental practices.

The media and interest groups have become very influential in changing a company's corporate culture in response to external pressures (Greening, 1992). The power of public influence over corporate change was one of the hypotheses tested by Greening (1992) in a survey of 117 utilities. The survey included a series of questions about the extent to which environmental issues were integrated into corporate planning. One of the findings was a positive relationship between interest group pressure and a firm's integration of environmental issues. Greening suggested that whether a company has experienced crisis or not will explain the existence of a firm's "issues management structure". Post and Altman gave an example of a company that was in the second phase of "Adaption" when it began to work more with the community and local environmental groups. Greening found that the emergence of interest groups represented a significant stage in the life cycle of an issue and determined whether the issue will die a quiet death or will be catapulted into the public eye. He asserted that "Any view of issues management which ignores the power of public interest is naive."

Mandatory Public Environmental Reporting

Public pressure has often been cited as one of the strongest motivating factors for firms to change their behavior. Economists would argue that public pressure is the single biggest factor explaining (publicly traded) corporate behavior since markets value companies based on their behavior. Cohen and Konar (1995) tested the hypothesis that significant

stock price reductions resulted from publicly disclosed toxic release emissions information required under the Superfund amendments in 1986. They theorized that a company's disclosure about their environmental performance may have significant implications for the expected future cash flows of the company. They cited Hamilton (1995) as saying publicly traded firms whose toxic release information were publicly disclosed experienced statistically significant negative abnormal market returns. Hamilton stated that "The implication of this drop in stock price is that investors expected there to be increased pressure on the firms to spend resources on reducing pollution, thus lowering firm profits."

In addition to collecting Toxic Release Inventory (TRI) from publicly traded companies, Cohen and Konar (1995) obtained stock prices and two other measures of environmental performance: oil and chemical spills and government-imposed fines for environmental violations. They obtained these data to determine if a positive link existed between TRI emission reductions and other areas of environmental performance. They wanted to test if companies reduced their TRI emissions as a result of receiving abnormal returns, and if they also took actions to reduce the possibility of other bad environmental news. Even though spills are usually accidents, they believed companies can take actions to reduce their future likelihood and severity. Thus, they posited that a reduction in the number of spills may indicate better environment management techniques that may lead to improved environmental performance.

They recognized that while government-imposed fines are one indication of environmental performance, they were also aware penalties are discretionary, politically-based, and/or randomly enforced. They also

realized that enforcement trends may reflect changes in government enforcement programs. They found that the companies who received the most significant negative stock price reactions following the announcement of their TRI emissions, significantly lowered their emissions. They found that fines increased among the companies, but at a much lower rate than their industry peers.

Operating under the efficient market hypothesis, Cohen and Konar anticipated any abnormal movement in stock prices to be the result of *new* information that changes public expectations about the future prospects of the company. They emphasized that stock prices are affected when the public does not expect the negative reporting from a company. If a company was expected to be the highest polluter and was subsequently reported as such, they found little or no change in stock valuation because market valuation would already reflect market expectations.

In later work, Cohen and Konar (1995) showed that mandatory public disclosure can have a significant effect on market valuation, which is likely to induce the company to reduce emissions and to otherwise improve its environmental performance. Thus, in some situations, providing public disclosure may be an effective regulatory approach to reducing pollution beyond what is required under a regulation.

The recent interest in the use of information as a quasi-regulatory mechanism follows regulatory approaches such as Toxic Release Inventory, securities regulations requiring disclosure of certain environmental liabilities, and European government-sponsored "green labels" that provides information to interested public in an attempt to

affect company behavior indirectly through consumer, public or community pressure. (Cohen and Konar, 1995). Mandatory disclosure requirements might be viewed as a market-based incentive for companies to change their behavior. Public disclosure of a company's emissions may affect consumer purchase decisions.

Publicizing the names of polluters has been found to be one of the most effective regulatory strategies. In some cases up to 35 percent reductions in emissions have occurred from such public disclosure. (Business Week, May 31, 1993). In the Business Week article, industry officials were quoted as saying, "Companies just want to get off the lists of top polluters." Others said, "We knew the numbers were high, and we knew the public wasn't going to like it." To fend off an outcry, Monsanto was reported as slashing its worldwide toxic air pollutants by 90 percent and has since spent $120 million on 250 projects (Business Week, May 31, 1993). The article was quoted as saying, "When it comes to cutting pollution, generating goodwill and avoiding negative publicity can be powerful motivators."

Other studies (Dowling and Pfeffer, 1975, and Baram, Dillon and Ruffle, 1992) also determined that mandatory public disclosure is a powerful tool for changing public perception and for initiating organizational changes. Their findings showed that companies required to publicly disclose releases place a higher value on risks of certain products and production processes. These companies, according to Baram et al (1992), realized their "externalities" were more visible under the regulatory requirement to publicly disclose their emission levels, and were more likely to stimulate public reaction. One study revealed that over 60 percent of a survey of 220 executives at large multinational

companies admitted that one of the primary factors driving their environmental policy is the threat of adverse publicity or lawsuits (Cohen, 1997).

Other research found that the level of pollution varies among firms because of firm-specific factors that affect both the ability and incentive for pollution reduction. Company size was one firm-specific factor cited. Ability to reduce emissions was linked to financial resources and incentive to reduce was cited as sensitivity to public scrutiny (Cohen and Konar, 1995). Cohen and Konar (1995) found that the largest firms are most likely to reduce emissions subsequent to public disclosure of their emissions inventory. This is because larger firms have more reputation capital to lose in the event of bad environmental publicity. Larger firms are subject to more public scrutiny and have more at stake when considering the effect of negative publicity. A large company wanting to expand into different locations may find their environmental reputation affects their ability to get favorable zoning and tax treatment.

Among the more important findings of the effect of public scrutiny on a firm's environmental performance is the impact depends upon the extent to which a firm's environmental reputation matters and stakeholder pressures are important. Firms with the most to lose from a negative environmental reputation have a greater incentive to improve their environmental performance (Cohen and Konar, 1995).

Voluntary Public Environmental Reporting

Corporate social responsibility reporting are disclosures provided either in annual reports, or other media that summarize socially

responsible activities of a firm. The short answer to why companies provide disclosures is public pressure -- real or perceived (Simmons and Neu, 1996). In their study, Simmons and Neu found that continued media coverage of corporate activities related to environmentally-sensitive issues has increased the visibility of corporate activities. This, they posited, has increased the public pressure brought to bear by concerned stakeholders against various firms. Social disclosures in annual reports, they contended, are one way of managing the demands and concerns of stakeholders. Annual reports allow organizations to "balance" the negative media coverage.

Another function of social disclosures (Neu, Warsame and Pedwell, 1996) is to hide poor social or economic performance. Disclosures are cited as a cost-effective way to respond to stakeholder concerns regarding corporate activities (Simmons and Neu, 1996). The annual report is a primary information source for investors, creditors, employees, and environmental groups. Organizational managers view stockholders, and environmental advocacy groups as well as employees and the community as the primary audiences for social responsibility disclosures (Neu, Warsame and Pedwell, 1996). While there are different types of corporate social responsibility disclosures which include health and safety practices, hiring practices, and community activities, this discussion focuses on disclosures of an organization's environmental activities.

More than 150 companies now voluntarily disclose reports on their environmental performance (Nestel and Fava, 1997). A staggering amount of time, energy and money are invested in environmental disclosures - - over $5 billion a year. Today's average 32-page annual report containing environmental reporting costs in excess of $500,000 to

produce, or as much as $8 a copy (Neu, Warsame and Pedwell, 1996). By these statistics alone, it is apparent how important environmental disclosures are to many companies in shaping and changing public opinion of their environmental practices. Epstein and Freedman (1994) reported that 82 percent of the investors they surveyed wanted to see environmental disclosures included in the annual report, with a majority saying that environmental stewardship was more important than increased dividends. They suggested recent regulatory changes surrounding enforcement and increased civil and criminal penalties for environmental violations was responsible for stakeholders' interest in what was seen as a growing liability. Previous studies have shown that organizational managers often simultaneously release qualitative "good news" with quantitative "bad news" in an attempt to offset the impact of negative financial numbers (Neu et al. 1996).

Progressive companies were found to be more likely than their predecessors to provide disclosures in response to public pressure (Guthrie and Parker, 1989). As mentioned earlier, Cohen and Konar (1995) determined that company size was a useful barometer for the influence of public pressure for firms subject to mandatory corporate disclosure. Likewise, this appears to be an important factor in determining who will voluntarily disclose, along with industry grouping (Patten, 1991) which confirms what might be expected - - that large companies operating in environmentally sensitive sectors are more likely to provide environmental disclosures because of their susceptibility to public scrutiny.

Greening (1992) speculated that whether a company had experienced a crisis would explain what he referred to as the company's

"issues management structure." One of the ways organizations respond to external pressures is through corporate disclosures, which would be an element of Greening's "issues management structure". Simmons and Neu (1996) sought to determine if there was an association between events which are believed to challenge corporate behavior and disclosures in the company's annual report. They assumed that a positive relationship implied that managers may be using environmental disclosures as a way of forestalling challenges by regulators and other interest groups.

They also gathered profitability information to demonstrate that if there was a negative association between firm profitability and inclusion of environmental disclosures, they would interpret this as an attempt to divert attention from negative financial results. They found that firms subject to environmental fines during the year studied, were more likely to include environmental disclosures in the year-end annual report. In 74 percent of the cases where firms were subject to environmental fines, they reported management decided to include environmental disclosures compared to 44 percent of the time when environmental fines were absent. They reported the probability of observing this outcome by chance is less than 1 percent (Simmons and Neu, 1996). They reported little association between firms reporting losses and the presence of environmental information in the annual report. From their work, it appears that environmental fines may motivate managers to include environmental disclosures in the annual report as a way of responding to the stigma associated with the fine; whereas negative financial performance did not motivate managers to include environmental information in the annual report.

One of the main purposes of public disclosures is they allow companies to manage their external environment. Disclosures give companies an opportunity to shape public perception. Dowling and Pfeffer (1975) speculated that a company's image can be managed more easily through communication than changing its outputs, goals or methods of operations. At the same time a company is attempting to develop a public image through voluntary reporting of its environmental practices, public perception may "feed back" changes to its corporate culture depending on how closely the disclosure mirrors societal values about the environment which means, the influence of the public on a firm's environmental practices is not just confined to mandatory disclosures.

The extent to which a firm can shape public perception is one way of legitimizing a firm. As an example, Oliver (1991) illustrated legitimization of an organization's compliance with environmental regulations. He stated this elevates a firm's legitimacy and can protect it from public criticism. It is assumed that because firms depend on continued support of stakeholders, they will attempt to communicate legitimizing characteristics to this audience. It is inevitable that firms will have competing stakeholder interests to balance. Financial stakeholders and environmentalists often have different expectations of organizational behavior. Oliver (1991) commented that, when there are competing stakeholder interests, organizations often choose to defy or dismiss the demands of one group in order to meet the demand of more important groups. From this perspective, it makes sense for firms to overlook the demands of environmentalists since they are the least influential of the constituents. Oliver also proposed that "low effort" symbolic gestures (e.g. "good neighbor policies") aimed at demonstrating

minimal appeasement are another alternative to outright defiance of such groups.

Oliver (1991) found that when an organization's performance and survival are only moderately dependent on public opinion (e.g. arms manufacturer) avoidance tactics such as superficial gestures of compliance and restricted access to information on the company's practices (concealment) may be the extent of an organization's responsiveness (1991). Marx (1993) commented that: Reports are directed at those constituencies which can be expected to identify most closely with the company rather than at the company's critics. The purpose of these reports is to solidify support, not to proselytize. As this statement implies, environmental disclosures are directed at important and supportive constituents, not at critical constituents.

Oliver's finding that companies direct their attention to the most influential public group was confirmed by an empirical study conducted by Neu et al. (1996). Among the more important findings, the following was determined:

1. There were increased levels of environmental disclosures during unprofitable years to address concerns of shareholders;

2. Concern of creditors did not have an appreciable influence on levels of environmental disclosure;

3. Criticisms from regulators and environmentalists were also associated with the level of environmental disclosure although in opposing directions.

These findings showed that concerns of shareholders were the primary influence on the level of environmental disclosure.

The amount of media coverage given to environmental fines during a particular year was associated with increased levels of environmental disclosure. However, the amount of media coverage of environmental criticism during a particular year was associated with decreased levels of environmental disclosure.

Legitimacy and how companies use environmental disclosures to frame how financial stakeholders interpret financial information was studied by Neu, Warsame and Pedwell (1996). In their study, it was stated that publicly disclosed environmental reporting tends to have an aura of legitimacy as the public has come to place a certain value on this kind of reporting, and because the public cannot observe most of the firm's functions. The study stated that the public comes to rely on annual reports, financial statements and other public disclosures as imperfect proxies for these activities. This study determined this is especially true for quantitative data. The study noted, however, that organizational legitimacy is precarious since contradictions invariably exist between the firm's activities used to generate profits and social values. It points out how the emergence of well-organized and vocal groups such as Greenpeace, Earthfirst!, and others have called attention to this incongruency. Consequently, the study surmised the intersection of fractionalized social values, well organized and vocal interest groups and the necessity for firms to operate in a competitive global economy has made organizational legitimacy increasingly important, yet more difficult to attain. Accounting researchers have suggested that corporate

social responsibility disclosures may help to resolve some of the problems of organizational legitimacy.

Another finding was that companies using voluntary public disclosures to change public perception may deflect attention away from real environmental problems either by not including these issues in the disclosure, or by highlighting the company's positive environmental accomplishments with an attempt to echo well known social environmental values (Neu et al. 1996).

Most voluntary disclosures are highly selective in their content. Much of the reporting takes on a public relations focus where new business opportunities and markets driven by environmental requirements are offered. What is offered in these disclosures, or more accurately, the absence of hard environmental analysis, has come under increasing attack with critics calling these reports "greenwashing". These corporate environmental reports typically lack analysis and complete information on how corporate activities actually affect the environment (Environmental Manager's Compliance Advisor, 1997). Lober (1995) used the Toxic Release Inventory as an example of selective reporting, where he noted that half the corporate environmental reports contained each company's TRI, but only 19 percent reported the volumes of their greenhouse gas emissions.

Price Waterhouse (1990, 1992) found that 62 percent of companies surveyed were aware of environmental liabilities that were not yet recorded in their financial statements (Nestel and Fava, 1997). This meant that millions of dollars of potential remediation or environmental costs were not yet reflected in reported earnings which has resulted in

increased scrutiny of environmental reporting for financial purposes, by the Securities Exchange Commission (Nestel and Fava, 1997).

While some researchers argue voluntary disclosures about a firm's environmental performance are misrepresentative (Wiseman, 1982), others contend public disclosures are only partial representations of a company's environmental performance since companies selectively choose what is disclosed. Neu et al (1996) stated that public disclosures are meant to manage public perception, but not necessarily by providing false information.

While the debate about the value or accuracy of what is contained in environmental disclosures continues, there appears to be some changes in standardizing public disclosures of environmental performance. The Public Environmental Reporting Initiative (PERI) was founded in 1993 by a small group of sponsors, including Dow Chemical, DuPoint, IBM, Allied Signal, AT&T and Union Carbide. This type of effort appears to be rapidly gaining acceptance (Nestel and Fava, 1997). The PERI group has adopted public reporting and disclosure standards that include financial information and quantitative metrics for air emissions, wastewater discharges and solid/hazardous waste generation. The group also reports quantity usage and emission trends for some of the more highly visible performance indicators such as TRI, chlorofluorocarbons, other ozone depleting chemicals and carcinogens.

Sun Company and General Motors also adopted the Coalition for Environmental Responsible Economics' codes (CERES) for environmental management and reporting. This resulted from an investor-led group that promoted the controversial Valdez Principles following the Valdez

spill. The Valdez Principles were universally boycotted by industry claiming invasion of company privacy. (Nestel and Fava, 1997).

ISO 14000 (International Organization for Standardization) is another management system/life cycle/product stewardship system that is gaining acceptance. The widely adopted ISO 9000 (quality management standards) is believed to continue its expansion due to increased spending on pollution control and the potential impacts this may have on markets and pricing (Nestel and Fava, 1997).

Eco-Management and Audit Regulation (EMAS) is another reporting standardization system described as driving developments in the area of reporting, with companies making efforts to bring their reporting in line with EMAS requirements (Nestel and Fava, 1997). Among other actions, EMAS requires the company's environmental statement to be verified by an accredited third party. More and more European companies are now having their reports verified, but third party verification has not been embraced by their U.S. counterparts despite the clear credibility gains with stakeholders (Elkington and Spencer-Cooke, 1996). Fearful about liability implications, some U.S. companies have tried to rein in the environmental auditing activities of their European subsidiaries, or parent companies. But, according to Elkington and Spencer-Cooke (1996), and Nestel and Fava (1997), the trend is toward increasing levels of disclosure. While some caution about predicting whether PERI, CERES, ISO or some combination of systems will become industry standards, a number of researchers noted that many companies can be expected to follow the trend toward more rigorous reporting on key environmental performance indicators.

Some researchers have examined why some firms voluntarily go beyond compliance. As is the case with voluntary and mandatory disclosure, the public appears to be one of the principle reasons. For example, EPA's 33/50 program has adopted goals of voluntary reductions of certain chemicals (33 percent by a certain date; 50 percent by a later date) (Arora, 1993). Arora showed that many companies overcomply with the requirements, purportedly induced by consumer preferences for environmental quality. Consumers were found to value environmental quality. Firm's management strategy to meet these demands are two-stage where companies first chose a level of clean-up and then engaged in price competition.

Cohen and Konar (1995) also found that consumers' demand for less damaging products and expectations for less polluting processes, are two reasons for firms' over-compliance. This study stated that companies will voluntarily go beyond legally mandated regulatory requirement if in their best interest. They reported that companies tend to not pursue environmental strategies until confident of a payoff.

Whether through mandatory or voluntary actions, the literature provides consistent evidence that the public provides a strong incentive for companies to change their environmental behavior, and in some cases, public disclosure may serve as a viable regulatory tool for accomplishing environmental goals.

Barriers to Perform: Financial Considerations

The effect of public scrutiny on a company's environmental performance is entangled with financial considerations. In theory, each

company must weigh the costs of public disclosure of "negative environmental publicity" against the costs of taking actions to put the company in a more favorable light. Public perception can ultimately affect a firm's profit maximizing potential. While public pressures can create incentives for firms to change their behavior, financial considerations are often cited as the biggest barrier to environmental performance. Seventy five percent of those who disclosed Toxic Release Inventory data reported that availability of capital for process changes was very important in influencing their selection of equipment or operations (Roy and Jehassi, 1997). Another study on pollution prevention cited among the most commonly mentioned barriers to pollution prevention were the necessary investment of time, money and staffing (US EPA, 1996.)

Environmental regulations can affect a firm's financial resources through equipment and operational decisions. Costs related to meeting regulatory requirements include compliance costs for certain equipment and operations, production efficiency of equipment, and raw materials.

The pulp and paper industry presently spends approximately 20 percent of their earnings on environmental laws and regulations. This is in addition to $15 billion the industry has self-reportedly spent over the past decade on facilities to satisfy public demands for more paper recycling (Moore, 1996). Complying with environmental regulations is costly and may affect a firm's profitability. On the other hand, a firm that is efficient at pollution control might also be efficient at production. Moreover, a firm that does well financially can afford to spend more of its resources on cleaner technologies (Cohen, Fenn and Naimon, 1995).

According to Cohen and Konar (1995), a firm's financial ability plays an important role in determining emission levels. Firms with constrained cash flows are least likely to reduce emissions. They found that companies with tight financial situations had environmental performance that worsened relative to their industry peers. They also determined that firms with higher cash flows tended to be lower "baseline emitters" (emission levels prior to public disclosure) of toxic chemicals. Nestel and Fava (1997) reported that for many companies, environmental expenditures such as capital spending have become financially significant and can no longer be viewed merely as a "cost of doing business." They concurred with Cohen and Konar (1995) by stating that investors have become increasingly concerned about these major environmental expenditures in addition to the liabilities associated with these burdens.

While the effect of increasing environmental costs on a firm's financial health is generally undisputed, researchers are pointing out that some firms are using increasing environmental costs as a competitive advantage, especially as more firms shift from end-of-pipe as the primary method of pollution control, to pollution prevention (Cohen, Fenn and Naimon, 1995). Hauth (1990) found that more manufacturers are trying to minimize the waste they produce because of regulatory, economic and community concerns. In trying to minimize or prevent pollution, he argued these firms are substituting hazardous materials with less toxic substances, modifying or upgrading their plant systems to "design out" pollution and are changing operation and maintenance through revised procedures, training, inventory control and better housekeeping.

The notion that corporate environmental performance may be linked with financial performance has attracted limited academic research. However, Cohen et al. (1995) discovered many companies are convinced of the link, and viewed environmental costs as opportunities to outperform competitors. Schmidheiny commented "When viewed within the context of sustainable development, environmental concerns become not just a cost of doing business, but a potent source of competitive advantage. Enterprises that embrace the concept can effectively realize the advantages: more efficient processes, improvements in productivity, lower costs of compliance, and new strategic market opportunities. Such businesses may expect to reap advantages over their competitors who lack vision. Companies that fail to change can expect to become obsolete (Cohen, Fenn and Naimon, 1995)."

Several other authors have reported this competitive advantage and long term survivability resulting from companies integrating environmental issues. Woodhouse stated "The degree to which a company is viewed as being a positive or negative participant in solving sustainability issues will determine, to a very great degree, their long-term business viability." Mahoney said "Monsanto's ability to develop new products, enter new markets, sell our current products and operate our manufacturing facilities profitably depends upon continuous improvement in environmental performance." Druckman was quoted as saying "Continuous improvement of environmental management throughout the organization is a key factor for our competitiveness in the 1990's. Each business group and division now incorporates strategies to address environmental management issues in its strategic plan" (Cohen, Fenn and Naimon, 1995).

Other studies support the argument that business opportunities grow out of environmental costs. After months of debate over NAFTA Lichtinger (1996), is quoted as saying many companies overlooked the possibility that environmental protection could not only lead to an improved environment, but also creates business opportunities through innovation and sharing of technology across borders.

It is generally undisputed that financial resources are significant in determining a company's ability to comply with environmental regulations and can be a barrier to improved performance. However, recent research showed that progressive companies have moved beyond the traditional view that increasing environmental costs are no more than part of the costs associated with the firm's activities. Rather, these companies are using environmental costs as a means for producing greater efficiencies for competitive advantage.

Effect of Market Based Regulations on Innovation and Pollution Control Costs

The literature is dominated by proponents of market-based regulatory approaches. A growing majority from President Clinton and Al Gore's State of the Union address on reinventing environmental regulation (1995) to industry analysts, believe radical changes in the environmental system will result in dramatic improvements in firm profitability, ability to innovate and environmental compliance. Operational flexibility is on everyone's agenda.

Roy and Jehassi (1997) surveyed over 1000 respondents on industry motivation for pollution prevention. Their work noted that while traditional environmental regulatory programs were almost unrivaled in

bringing the attention of business decision makers to their environmental obligations, there may be room to improve regulatory effectiveness in facilitating companies in meeting those obligations. They also commented that traditional regulatory programs that establish limits on what can be released into the environment, are argued to be both motivators and inhibitors of pollution prevention. End-of-pipe approaches under a traditional approach were described as inhibiting pollution prevention since it focused on technology requirements, whereas some companies were motivated to find cost-effective ways, such as pollution prevention, to comply with traditional regulatory approaches.

Other studies confirm the benefits of a market-based system. The Business Roundtable is an association of chief executive officers who examine public issues that affect the economy. In one of their studies (1993) they evaluated several "best in class" facilities made up of large corporations to determine what it was that made these facilities successful in developing an environmental hierarchy. Of the common elements found among these firms, flexibility to choose regulatory tools was cited. These firms responded that flexible regulatory tools was critical to adapt environmental strategies to the facilities' culture and needs, as opposed to regulators telling them how to prevent pollution. Another finding was that facilities spent more on compliance in response to government regulations, than on pollution prevention (1993).

Pollution prevention is one market-based regulatory approach, whose success has recently been tracked among several statewide programs. One study of Central Massachusetts' Pollution Prevention proram yielded 87 percent of the firms receiving on-site technical

assistance or attending workshops reported toxics use reductions compared with 39 percent of similar firms in the same region. (US EPA, 1996). Another study reported significant pollution prevention where firms changed processes or materials, came into compliance, saved significant amounts of money, eliminated sizeable pollution or established an on-going program. This study reported environmental benefits to the Merrimack River Watershed and cost savings for industry. 1.7 million pounds of toxic wastes eliminated, and over $1.9 billion saved by industry (US EPA, 1996). Clearly there are benefits related to market-based approaches.

Innovation has long been thought to be linked to regulatory approach. This is confirmed by Magat (1979) and Bhatnagar and Cohen (1997). Both of these studies found that the incentive to innovate is stronger under market based systems than under command and control regulations. Bhatnagar and Cohen (1997) found that virtually all theoretical models linking environmental regulations to innovation were found to be market-based approaches. They asserted that properly designed environmental regulations can trigger innovations that can partially or fully offset the cost of compliance (Bhatnagar and Cohen, 1997) They stated that: "Unless innovation is needed for technological reasons to meet a regulatory standard that is otherwise unachievable, innovation is also likely to reduce the cost burden associated with meeting more stringent regulations." Their study examined whether stricter regulations, as measured by higher pollution control costs and stricter monitoring and enforcement actions stimulate environmental innovation. Their research covered 146 U.S. manufacturing companies from 1983 to 1992 and showed that more stringent environmental regulations stimulated innovation in environmental protection (as

measured by the number of environmentally-related patent applications); however, they found there was no evidence that these environmental patents increased industry profits.

Lichtinger (1996) made a case for wider and more effective use of market incentives in environmental regulations : "Those who believe that markets work better than bureaucracies should fully support the use of environmental policy instruments that build the cost of environmental degradation. Doing so, instead of relying predominately on command and control regulatory approaches, raises productivity." The report cites three ways in which market-based approaches would succeed over more traditional policy approaches:

1) Firms can adopt the environmental controls that are cost-effective rather than following the prescribed technological solutions imbedded in regulations;

2) The costs of environmental controls can be redistributed among firms in ways that induce those who can clean up relatively inexpensively to do more; and

3) The profit motive can be enlisted more forcefully to develop new and better methods to deal with environmental problems since in a market economy one firm's costs is another firm's opportunities.

Zimmer (U.S. Representative from New Jersey, 12th district) attempted to have Congress advocate for more cost-effective regulatory

approaches. In particular, he is promoting the enactment of a single comprehensive act that enables EPA to address multi-media pollution in the most cost-effective manner (Environment Strategy America, 1996). He concluded that command and control should be the last regulatory option exercised with the primary goal being an overall reduction of risk instead of an arbitrarily defined reduction of risk from a particular process or substance. He argued that Congress needs to harness market forces to encourage conservation of resources and pollution prevention.

Regulators have recognized the difficulty and challenge in regulating area or "nonpoint sources". Environmental agencies are just beginning to shift their emphasis away from large industrial sources to smaller area sources. Applying the command and control approach is particularly problematic for hundreds of smaller, more diffuse sources. Financial resources are even more of a concern with this group, thus the traditional compliance assurance under the command and control approach, are either prohibitive or are administratively unmanageable for the agency. A centralized regulatory approach such as command and control was viewed as unworkable in agricultural settings because such approaches deny farmers the flexibility to choose among the full range of pollution control options while responding to changing economic, environmental or technological conditions (Congdon, 1996). Clearly this argument applies to a wide range of area sources and other industrial point sources as described above. Command and control approaches were found to necessitate a high level of administrative involvement by regulators. Even when the pollution control goal is met, there are significant shortcomings in using such approaches with nonpoint sources.

Researchers argued that a successful regulatory approach must respond to widespread concerns over the costs of regulation. In many situations, tradeable discharge permits, effluent fees, surcharges on inputs, or other incentive-based programs can satisfy requirements for accountability, flexibility and cost-effectiveness and still achieve an environmental goal (Congdon, 1996.)

Vig and Kraft (1990) stated three reasons that economic analysis and market initiatives are increasingly useful in dealing with the environmental problems of the 1990's. First, they argued that regulators are finding that solutions are more and more costly as they address more complex and deeply rooted national and global environmental problems; Thus, it is increasingly important that the public gets its "money's worth" from these policies. Second, they argued that the slow progress made over the past twenty years in air and water pollution problems necessitated the need to use private initiatives more effectively through altering the incentive structure. They believed this meant relying more on pollution charges, tradeable discharge permits, and deposit-refund systems. Finally, they cited that the high aggregate cost of controlling pollutants and environmental threats makes designing policies that are cost-effective more imperative.

Bhatnagar and Cohen examined the possibility of company innovation in the absence of government regulations. In accordance with Van der Linde (1993), they found that government standards are required for three reasons. First, since companies are likely to receive indirect benefits that completely offset the costs of compliance in only a limited number of cases, the government must push firms to innovate. Second, government-backed standards serve as signals to industry that

environmental issues will take on a greater significance in the future. Finally, standards create the necessary pressure to prod firms into initiating changes.

However, many companies prefer voluntary efforts to legal mandates to provide the latitude to spend their pollution control resources more effectively. Companies such as 3M, Dow Chemical and American Telephone and Telegraph have found that many investments in pollution prevention pay for themselves in reduced costs (Business Week, May 31, 1993). Others involved in voluntary programs such as EPA's Project XL, find cost savings or economic opportunities, and/or reduced paperwork burdens when allowed to choose the compliance method to achieve environmental standards. Incentive-based mechanisms can play an important role in achieving pollution control targets in a more cost-efficient manner.

Opposition to incorporating market-based strategies in the mix of regulatory choices is difficult to find, at least from an industrial point of view. Some would argue all regulatory approaches should use a market approach since this approach reportedly will lead to additional benefits at lesser costs. The purported effects of a system based in part on market-based approaches are nothing short of radical improvements to the emissions level impasse experienced under the current regulatory regime. While much of the literature has an industry-perspective, it should be noted that environmental groups often express a different view of growing skepticism of relaxed regulatory requirements.

These interest groups worry that market-based approaches primarily represent benefits to firms in the form of operational flexibility,

less reporting requirements and not as much oversight. They voice concerns about undoing the important environmental gains brought about by the draconian system criticized by industry. More progressive environmental interest groups will rationalize improvements most certainly need to be made in the existing system dominated by a command and control approach, and in some specific cases, under regulatory oversight, additional gains may be realized using select market-based tools. However, they caution against dismantling what has heretofore been a relatively predictable system of environmental control.

Literature Summary

Organizational models can be used to describe firms as moving along a continuum, with respect to environmental performance. These models describe organizations as integrating environmental issues over time. Several studies indicated a link between certain characteristics found among firms at various stages and their environmental performance. The characteristics described in later stages included existence of a written corporate environmental policy, long term environmental planning, links between environmental issues and production, and the extent to which environmental issues permeated decision making in key business functions.

The literature consistently showed the further firms were in terms of integrating environmental issues into strategic business areas, the better their environmental performance. Research indicated virtually all the high performers were consistently found in the latter stages. This information can be useful to regulators in that tools can be designed to more closely match a company's position according to organizational models. In other words, a firm still in the beginning stages may respond more favorably to technical assistance than a firm in the more proactive or "innovative" stage.

Several factors were cited in the literature as being responsible for moving firms along this progression, including exposure to "crises", and other internal factors such as corporate culture that reflected management's commitment to environmental issues; however, the most significant factor cited to stimulate environmental progression in

organizations was the pressure of public interest groups, which can be linked, in some cases, to environmental crisis.

Mandatory public disclosure of toxic emissions can affect a firm's stock values. An interesting finding was that markets responded to publicly disclosed information that was unexpected. In other words, the market reacted when they did not expect a particular firm to be a high polluter. It did not have similar reactions to other disclosures when a firm was expected to be a high polluter. This may suggest that this strategy works only when the information is new to the market, and the market has not already accounted for such information in their valuation of such firms.

Markets apply a significant pressure to promote organizational change. Use of information as quasi-regulatory tools has not been used since the Superfund amendments in the late 1980s; possibly because of increased political pressures on environmental agencies. However, regulators can still incorporate publicly disclosed environmental information in their mix of regulatory choices, perhaps through the use of public interest groups, or other third parties, or perhaps as part of enforcement actions. Regulators may also want to use this information as a strategy for firms with environmental reputations not yet factored into public perception.

A distinction must be made between publicly disclosed environmental information that is mandatory -- and part of a regulatory requirement, and voluntary disclosures. The driving factors that prompt disclosures are obviously different between the two, and the ensuing

effects on the organization and, possibly the market can be quite different.

Voluntary disclosures were also found to affect market perceptions, and markets came to rely on such disclosures as "credible" representations of the firm's activities. However, the firm can control the content and presentation of voluntary disclosures. It appears that often accountants view their responsibility as reviewing only the financial portions of such disclosures which does not include auditing the environmental information. Some researchers suggested that this fact casts doubt on the accuracy of environmental information in publicly disclosed corporate reports, particularly since companies often position environmental information close to financial information to increase credibility.

Several researchers questioned the credibility of environmental data in corporate reports, stating that the majority lacked analysis of anything related to environmental activities. A more sinister view was the finding that some firms actually failed to disclose significant environmental liabilities in their reported earnings. Such practices are being followed more closely by the Securities and Exchange Commission and are being addressed by increased use of reporting standards.

Despite these concerns, voluntary disclosures are powerful tools used by firms as strategic tools to frame the corporate image in the hopes of changing public perception. They can conceivably be used to complement or even offset negative impacts of mandatory disclosures, and may be used to balance negative media treatment. To the extent a

firm can effectively "mirror" societal values, this may be one of the most cost-effective tools for controlling market perceptions.

Financial considerations were stated as being both an inhibitor of environmental performance, in terms of increased costs, and a motivator, with respect to stimulating innovation and competitive advantages. Financial issues were described as being entangled with the effect of public scrutiny on a firm, as firms will ostensibly weigh the costs of changing negative public perception with the costs associated with remedying the environmental practice that led to the negative perception. One study suggested it is easier to manage public perception through communication than by operational changes.

Environmental costs appear to reach into nearly every functioning part of an organization, from equipment choices to operational practices. A link appears to exist between a firm's financial performance and its environmental performance that goes beyond the obvious connection based on resource availability. This link is described in terms of markets viewing a firm's environmental record as bearing on its profitability. A firm that is efficient in its pollution control is typically judged as being efficient at production. The significant market drop observed after firms publicly disclosed their toxic emissions was concluded to be due to investors expecting an increased pressure to spend resources on reducing pollution, thus lowering the firm's profits.

Market-based advocates have the strong opinion that regulations that follow this approach will result in innovation, cost savings both to the firm and regulatory agency, and improved environmental compliance. This view was tempered with concerns from an environmental

perspective which notes that the traditional command and control approach, cumbersome though it is, has achieved significant environmental gains to date. One of the primary concerns has to do with disrupting this record of accomplishment.

Despite the debate about market-based approaches, it is apparent that firms vary in their response to different regulatory initiatives. Some industries respond favorably to technical assistance, others find it of little value. Some firms might find toxic use planning requirements valuable in identifying pollution prevention options, others find them hollow paperwork exercises.

The research attempts to test a number of the arguments developed in the literature. The principal paradigm examined was the contention that the development of effective regulations must incorporate the factors known to stimulate corporate growth in environmental management. Such growth in management can only occur if regulators have an adequate understanding of organizational behavior in order to design regulatory initiatives that can overcome the present condition of diminishing environmental returns.

This growth in environmental management appears to be driven by an array of factors. In this research, it was attempted to determine whether incentives and barriers lead to improved environmental performance as manifested in the area of air pollution control. The relative importance of various factors identified in the literature was determined through surveying large industrial sources of air pollution and through interviews of environmental agency staff. Factors examined included such elements as management's commitment to environmental

directives, training on such directives, comprehensibility of environmental regulations, linkage of compensation to environmental performance, and relationship between the sources and the environmental agency. Integration of corporate policy was examined by testing the consistency of responses from personnel at various staffing levels at the companies.

Methodology

Introduction

Environmental performance is clearly described as being driven by an array of factors. This research attempts to test that assertion by surveying two large industrial sources of air pollution, and personnel at a state environmental agency. The focus of the research is to determine the relative importance of factors expressed in the literature related to incentives and barriers to environmental performance. In addition, the survey will attempt to determine the extent to which other factors, such as management commitment to environmental directives, training on such directives and environmental regulations, the comprehensibility of environmental regulations, linkage of compensation to environmental performance, and the relationship with the environmental agency significantly affects a company's environmental behavior.

Information related to environmental performance was collected in two ways:

- telephone and in-person interviews of two major industrial sources of air pollution; and

- telephone and in-person informal interviews with city, state and federal environmental agency staff, consultants, academe, and industry.

Survey

Two large industrial sources of air pollution in the forest products industry were chosen to survey as part of this research. The surveys were conducted during May and June, 1997. These firms were chosen for three reasons: 1) the forest products industry is a key player in the Pacific Northwest's economy; 2) the forest products industry has faced continued environmental crises, particularly over the past decade; and 3) these firms, in particular, have been in business for many years.

The forest products industry has been a key player in regional economics for decades. Yet, it has been in turmoil for a decade. This industry struggled through recession in the early 1980s. In Washington state, over 70,000 people worked in the forest products industry and produced approximately seven billion board-feet in 770 mills during 1979, a boom year (Shinn, 1993). Three years later, the number of forest products industry employees dropped by 10,000, total number of processing sites dropped by 200, and total output of lumber dropped by about two billion board feet. By 1984, only 442 mills (sawmills, plywood, pulp and others) were reported in a Washington State survey (Shinn, 1993). At the time, conventional wisdom suggested that the economic downturn would move toward recovery. Conventional wisdom was wrong. High price stumpage bid up in double digit inflation in 1979 and 1980 and high lumber costs and imports combined with low demand for housing starts kept the economic downturn in place. Fundamental changes in the forest products industry occurred from 1982 to 1985. Plant closures, buyouts and land sales changed the face of business.

The forest products industry has operated in an uncertain business environment for many years. Frederickson (1980) selected the sawmill industry to study because of its environmental instability. He reported that the sawmill industry ranked as the third least stable industry among fifty randomly selected industries. This environment is characterized by unstable log supplies, evolving milling technologies, an increased expectation for international trade, a shift to smaller second growth timber and the reduction of federal forest harvest levels. In addition, this sector has experienced continued public scrutiny of its operations with respect to environmental impacts. Based on these factors, it is assumed that the firms selected have considerable experience with environmental regulations and environmental management and can knowledgeably respond to questions of what factors drive environmental performance.

In light of the uncertainty in which these two firms operate, the research sought to identify certain internal characteristics thought to be linked to environmental performance which are indicative of firms responding to continued external pressures such as environmental regulations.

Companies Surveyed

Company A is a Fortune 500 company with approximately 13,000 employees. It has 96 plants in 21 states with two main divisions: paper and building materials with 55 percent of sales coming from paper products. The company produces corrugated containers, pulp and paper, business forms, cut sheets, bags, inks, preprint, plywood lumber,

particleboard, engineered wood products, and medium density fiberboard. Net sales in 1995 were $3 billion.

Company B is a Fortune 500 company employing approximately 20,000 employees. It operates in 36 states, Australia, Canada, Germany, Mexico and the United Kingdom. Business lines include office products distribution, wood products and building materials distribution. Total sales are fairly evenly distributed among the business lines. Net sales for 1996 were $5 billion.

Both sources are operating in an environmentally sensitive sector of the economy, so their public exposure is similar. As a general observation, one company appeared to be more environmentally progressive, although that impression might depend on the individual personalities of the respondents. Several individuals from each company were interviewed, from environmental engineers at the facility to corporate attorneys. Each facility was informed that their company name would remain anonymous.

A copy of the survey instrument is shown in Appendix A. The main areas of inquiry were:

Basic facility information
Corporate environmental policy (how long in existence, degree of integration, consistency throughout company, impact)
Management commitment to environmental management
Environmental performance measurement
Training
Motivation to go beyond regulations

Human/financial resources allocated to environmental management
Regulations (clarity, administrative burden, flexible/inflexible)
Alternative approach to regulations
Relationship with regulatory agencies
Barriers to environmental performance
Public influence on behavior

Analysis of the survey responses was conducted at a general level, with emphasis on identifying broad trends. The survey instrument was designed to explore, at a qualitative level, the facility's experiences with different factors known to influence environmental performance; it was not attempted to determine specific changes in corporate behavior under controlled conditions. Reflecting this qualitative approach, the study uses raw numbers of respondent answers to individual questions to describe the facility's experience with factors influencing its environmental performance.

Staff from the environmental agency were informally interviewed without standard survey questions. Staff interviewed included those involved in writing rules, pollution prevention, compliance and enforcement, permit writing, inspection and technical assistance. Consultants and staff at an energy audit office were also informally interviewed.

Caveats

This evaluation is intended to determine the relative importance of certain internal and external factors and environmental performance.

The study is intended to produce information on broad trends related to respondents' views on factors affecting their company's environmental performance. The number of companies surveyed and personnel interviewed, was small and was not large enough to provide any statistically significant relationships.

The questionnaire was designed so that all questions and discussions were qualitative rather than quantitative. For example, survey respondents were asked to characterize the extent to which the corporate environmental policy affected change in their environmental management, but were not asked cost savings or to estimate waste reduction.

Responses to the survey were provided voluntarily by both companies and regulatory personnel. Company personnel were read an Informed Consent which is presented in Appendix B. Survey bias was probably introduced among several levels, one being the quantity of open-ended questions. The respondents were informed that the surveyor worked for an environmental agency. Despite an understanding the study was being performed as a university project, and as such, all resulting information was to remain confidential as possible, the results should be taken with caution. Generally, the views of respondents and others involved in discussions were taken at face value. However, there is always the possibility of some bias in the views expressed. Discussions were not conducted under controlled conditions, although the surveyor attempted to ask questions objectively.

Finally, the survey questions were based on asking questions on a "global" level, such as how external pressures manifests itself internally,

as far as existence of an environmental hierarchy, rather than a "local" level where questions would be asked about how external pressures affect key operating decisions, such as production. These questions were asked of staff in environmental positions, rather than a variety of staff in other functioning areas of the business, to obtain the most pertinent information about environmental behavior.

Results and Conclusions

The following results and conclusions were obtained from surveying the companies:

Conclusion #1: Written corporate environmental policies establish the framework for integration of environmental issues, and demonstrate management's commitment to environmental performance.

All respondents stated they had a corporate environmental policy, and that the policy was critical to overall environmental performance. One of the companies developed their policy as a result of an environmental threat. One respondent said it did not ensure environmental performance, since implementation of the policy was more important than the policy itself, but it set the tone for environmental management practices. Another stated he would look askance at a major corporation that did not have a written environmental policy.

In both cases, the policy was the same for all facilities, corporate-wide (which spanned different states), although it was specific to different divisions of the company. Respondents from both companies said it was not applied consistently which led to different environmental performance throughout the company. The main reason cited for inconsistent application had to do with the size of operations, and the difficulty of maintaining consistent performance. Differences in performance was primarily affected by the facility manager's interpretation and commitment to the policy. Other reasons cited were the presence of a contingency of "old timers" whose attitudes about the environment were slowly being replaced by new generations of workers.

Still others had to do with the amount of emphasis of a facility manager on environmental issues over safety.

When asked whether the policy made a practical difference in operations and ultimately environmental performance, the responses were that environmental performance varied before and after introduction of the policy. It is difficult to assess exactly how much effect corporate environmental policies have on changing behavior, but the responses were uniform. All respondents from both companies said that corporate staff would have to "arm twist" operational staff before the policy was developed, to improve their environmental performance. Afterwards, the written policy gave new significance to upper management's commitment. One respondent observed that the policy endorsed the fact that the environment was an important part of the operating facility.

When asked whether corporate or facility personnel had a greater impact on implementation, all respondents said it was the hourly staff at the facilities who were most responsible for making sure environmental goals were met since they were involved in the day-to-day operations and were the closest to the activities. As to how integrated the policy was throughout the organization, one respondent said their company restricted new chemical use until it was signed off by a number of people involved in environmental management. "It's like signing your life away to get a new chemical" was the response. The respondent said this compares to a time when chemical manufacturers routinely dropped off chemicals without much approval. A consistency of respondent answers was noted throughout all levels of responsibility, which seems to indicate fairly uniform integration of internal environmental policy.

Conclusion #2: Environmental performance tracking systems are necessary components of an integrated environmental management structure.

All respondents described tracking systems in various stages of development. An environmental database was the minimum system described, which tracks upsets, penalties, number of violations, all of which were reported by facility personnel. One respondent said all incidents, including those that do not need to be reported to the regulatory agency, were included in the database. Another respondent said their environmental database was an albatross and was about to be updated by a more sophisticated system which integrates production information with environmental performance. Others said their tracking system was getting more sophisticated over time and they were beginning to develop profiles of each facility, and eventually will be able to do comparative analysis of all facilities. The original purpose, as reported by some respondents, was reporting to the Board of Directors. Now, the information is used throughout the company. When the next phase is complete, anyone on the network at one company will be able to access information on production and performance, can write their own program and analyze trends on waste differences between facilities and temporal variations. It was reported that most facility managers certify compliance with applicable regulations.

The general response as to the type of environmental performance tracking mechanisms included environmental databases, annual internal audits, annual emissions inventory which included raw material utilization, monthly staff meetings where location managers report status

of facilities, review by environmental engineers of plant specific equipment, and external reporting to regulatory agencies (e.g., quarterly reporting of equipment upsets). The major response of what was tracked was predominately upsets. When asked how respondents knew they were in compliance, one response provided was their annual internal environmental audit. In addition, one respondent said every three years an independent attorney and consultant was brought in to evaluate their operations, focusing mostly on how well the company is doing on documentation. When asked if there was a positive relationship between environmental tracking and environmental performance, the responses were almost unanimous. One respondent felt it was less important to be 100 percent in compliance, than it was to see the numbers (e.g., waste generation) go down and to lessen swings in production.

Conclusion #3: Linking job performance to environmental performance enhances a company's environmental performance.

This question elicited different responses. Some did not know if job performance was linked to environmental performance, while others said some positions got bonuses for good environmental performance. When asked if job performance should be linked to environmental performance, all respondents believed it would make a big impact on environmental performance. Some said supervisors were paid bonuses on safety issues.

Conclusion #4: Financial resources are a barrier and incentive to environmental performance.

None of the respondents had a clear sense of how much of the budget was allocated to environmental management, but several responded it was insufficient to meet increasing regulatory demands. One respondent talked about expenditures related not only to staying in compliance with regulatory requirements, but a public complaint forced them to make additional investments of $1.5 million for controls that went beyond compliance. Many responded that increasing administrative burdens related to regulatory requirements resulted in the need for additional staff. One responded that since the introduction of Title V operating permits, which has significant recordkeeping and monitoring requirements, they had to hire one full-time person to do nothing but manage that permit. While these comments relate to regulatory requirements, they point out a shift in financial priorities, which could be used for other efforts netting more direct environmental benefits.

The majority responded that additional financial resources made available for environmental management would have a positive effect on environmental performance. When asked if that meant unlimited resources would result in outstanding environmental performance, the responses changed somewhat to a recognition that financial resources is one variable affecting environmental performance but several other factors must be present for efficient capital utilization.

Other responses suggested economic "costs" of environmental regulations are also an incentive for firms to reduce costs of compliance.

Conclusion #5: Regulatory requirements are another important barrier to environmental performance.

Respondents were asked about whether the comprehensibility of regulations, and the relative burden of administrative requirements had an effect on environmental performance. Most responded that there was a relationship, with one offering the complexity of the regulation accounted for a significant difference in performance between two of their facilities in two different states. The overwhelming response was that the administrative burden, which was regulation-specific, interferred with environmental performance since resources were taken away from monitoring equipment, and other aspects of environmental management. Flexibility was cited as a possible solution.

Conclusion #6: The relationship between companies and the environmental agency is important to the company's environmental performance.

Almost all respondents said the quality of the relationship between their company and the regulatory agency affected their environmental performance. Some even stated they would welcome greater involvement of the agency in their daily operations, and would prefer to have a good working relationship with agency inspectors to work out compliance issues, as a preemptive measure to penalties and public involvement.

When respondents were asked where they found out about most regulations, there seemed to be a relatively equal reliance on internal and external sources including trade associations, industry organizations, the regulatory agency and their legal department. When asked about the effect of early involvement in the regulatory process and ultimate

environmental performance, no one questioned the importance of early involvement in the regulatory process and its affect on how the regulation was implemented. In some cases, it was cited that their involvement helped set the standards of what they felt was reasonably achievable for their industry group. One respondent talked about involvement in new regulations which brought about a better understanding of why regulatory language is so broad, and information about others in their industry group that were affected by the regulation, which stimulated transfer of information between sources. Because regulations often affect a broad universe of regulated sources, this respondent stated that involvement in the rule development process gave him a better understanding of why regulations are often written with exceptions to help fit the regulation to such a broad group.

Comments about the link between the regulatory agency and their companies ranged from agreement of its importance to ongoing compliance and ultimate performance, to the importance of a team approach where the agency and the company are going to make the regulation fit. One respondent talked about regular tours of their facilities with agency inspectors to increase the agency's understanding of their operations. This respondent was encouraged by technical assistance efforts by the agency, and felt the agency could do more non-enforcement review opportunities.

Conclusion #7: The public has undisputed power to influence firms' environmental behavior.

The influence of the public on both companies, easily resulted in the most unanimous and strongest responses as to what influenced their environmental performance, which is what would be expected of two

large, industrial companies doing business in very environmentally sensitive areas. More than any other variable tested, it was apparent that the public influenced their environmental business decisions on every level. One respondent stated, "If the public didn't want us here, even if we met all the regulations, we wouldn't be." This was echoed by another respondent who said at one facility they were operating in compliance, but because of the public perception of some visible emissions, they installed additional controls in the amount of $1.5 million that went beyond regulatory requirements. Most respondents said that public perception linked all of their facilities' performance that resulted in a public perception of the company as a whole, regardless of different compliance records at different facilities. The fact that public perception somehow links all facilities together, irrespective of facility differences, makes uniform application of corporate environmental directives important. Both companies appear to be well aware of the need for corporate-wide environmental consistency.

The research upheld the hypothesis, and supports the position that a firm's environmental performance is related to a number of factors, many of which are internal firm characteristics related to its environmental infastructure. There appears to be a positive association between all the variables included in the survey and environmental performance.

The following are averages of rankings of these variables using a Likert scale, with 1 being low in importance to environmental performance, 10 being high:

Corporate Environmental Policy (9)
Upper management commitment to policy (9)
Other management commitment to policy (8)
Hourly staff commitment to policy (9)
Consistent application to policy (8)

Training on Corporate Environmental Policy (7)
Training on regulations by *company staff* (7)
Training on regulations by *regulatory agency* (8)
Training on regulations by *industry organization* (8)
Technical assistance by *company staff* (8)
Technical assistance by *regulatory agency* (4)*
Technical assistance by *industry organization* (8)

Environmental performance tracking (7)
Compensation linked to environmental performance (8)

Adequate financial resources allocated to environmental management (8)
Adequate human resources allocated to environmental management (8)

Regulations (clarity) (8)
Regulations (administrative requirements; does this have a negative effect on performance) (8)
Relationship with regulatory agency (9)
Public influence (9)

*Lower ranking due to some respondents suggesting agency staff turnovers makes the agency an unreliable source for technical assistance.

The major findings of the study are:

1. Internal characteristics in firms are linked to environmental performance;
2. Financial factors are both an incentive and disincentive to environmental performance;
3. Flexibility and certainty in regulatory strategies are key factors affecting environmental performance; and
4. The public is one of the strongest motivators for (some) firms to improve environmental performance.

One observation is added on the issue of inconsistent application of corporate environmental directives. Large firms are comprised of staff who specialize in certain parts of the organization. They are recruited specifically to perform a specialized role, have work and educational backgrounds related to that role and see career advancement related to that role. Consequently, businesses may be composed of staff with very different perspectives, interests and approaches to their work which may also affect environmental performance. The specialization of staff also presents a challenge for understanding environmental integration. The staff responsible for a business's environmental management may be quite removed from those responsible for designing, producing and marketing the firm's products. This separation is problematic for instituting certain environmental strategies that need to be addressed in core business decisions such as those involving product design, production process design, operation and maintenance.

Recommendations

The recommendations originate from all parts of the study: literature review, survey results, and informal interviews with city, state and federal environmental agencies, consultants, an industry representative and academe.

The following describes the proposed recommendation aimed at State environmental agencies, Oregon Department of Environmental Quality in particular, which seeks to address the major findings of the study. Where the recommendation cites "agency" or "environmental agency", this is meant to refer to Oregon Department of Environmental Quality. Many of these recommendations do not neatly fit under just one "major finding" heading; rather, there is considerable overlap in that many of these recommendations apply to more than one heading. For example, technical assistance has been shown to ameliorate economic barriers, can address regulatory uncertainty issues raised by firms (e.g. clarify misunderstandings about requirements), and may be part of a flexible regulatory initiative.

It should be noted that the recommendations offered do not represent a significant change from the current regulatory system; rather it represents minor modifications offered to the majority of firms. Agencies may want to address smaller classes of firms with exemplary environmental records separately with stronger "carrots". The recommendation can be characterized as having a command and control "framework", in that standards and basic requirements remain the same; However, flexibility is incorporated throughout as a "carrot" to address firm disincentives, and is accompanied by fee structures and

enforcement and compliance components as "sticks". Despite considerable current discussion about radical shifts in regulatory programs, there are fundamental elements that must be in place to ensure continued or improved environmental progress. However, improvements in the overall system are warranted.

A process of assessing the effectiveness of regulatory tools is described in Tables 1 and 2. There are many stakeholders involved in environmental issues, but the major competing interests addressed are impacts to industry, impacts to the environment and impacts to the agency. Table 1 lists criteria used to assess the effectiveness of regulatory tools and supporting items under each heading and Table 2 rates the effectiveness of select regulatory tools in meeting these criteria. For instance, design standards are rated as reliable in terms of meeting the criteria of impact to air quality (e.g. demonstrating environmental results), but not as good in terms of the criteria of impact to industry in that it may be restrictive in offering firms implementation choices.

It should also be noted that even if regulatory strategies address some or all of the incentives and disincentives reported in the study, this may not be sufficient to result in improved environmental performance. Many factors drive a firm's behavior. Technical barriers, for instance, which were not addressed in the study, are known to be disincentives for some firms. It is also not known what the relative importance of one incentive is over another, and if use of one incentive versus two or three together changes behavior. For instance, while regulatory flexibility was found to be a key factor related to environmental performance, some interviews indicated regulatory relief alone may not be a big driver for

some firms unless the firm can be shown tangible benefits of the initiative.

Although there are several documented examples of successful nontraditional regulatory programs that attempt to address firm incentives and disincentives, it is seldom a straightforward task to find out what originally motivated a firm to change its behavior. Many business decisions are made irrespective of regulatory pressures, and fall under the heading of "good business practices", meaning the motivation was strictly internal, and for reasons other than the regulatory requirement itself. Unpacking a firm's environmental behavior beyond the broad headings of incentives and disincentives is clearly beyond the scope of this study.

Recommendation#1: Identify internal characteristics in firms that are linked to environmental performance.

It was hypothesized that there is a link between certain internal characteristics of a firm related to the degree of integration of environmental issues in the organization (e.g. environmental performance tracking systems, corporate environmental policy) and its environmental performance. These factors are indicative of how a firm has responded to continued external pressures, such as regulatory demands. The hypothesis was confirmed by the survey and informal interviews. Environmental management systems allow firms to systematically deal with environmental challenges.

The literature describes organizational models as depicting firms as they transition through "stages" of development as they seek to adapt

to environmental pressures. The beginning stage of "Adjustment" was characterized by firms responding in a reactive, crisis management mode attacking environmental problems on a case-by-case basis without institutionalizing environmental issues. "Adaptation" is the second stage suggested where firms seriously reassess environmental values and begin integrating environmental issues into their decision hierarchy. The final stage of "Innovation" was described as firms with fully integrated environmental management systems cutting across all functioning parts of the organization. But, what can regulators do to influence the progression of firms through these stages?

The proposed recommendation recognizes the limitations regulators have on influencing how firms respond to policy initiatives. However, it is theorized that there are some ways regulators can influence this process such as through enforcement actions.

The importance of agencies continuing enforcement actions cannot be understated. Despite industry pressures that seek to reduce or eliminate agency enforcement efforts, enforcement needs to remain a constant incentive to deter bad environmental performance, and to stimulate firms to continually improve or maintain good environmental performance. It is strongly recommended that any regulatory approach adopted, whether command and control or market-incentives, include an enforcement component.

Enforcement efforts can incorporate innovative techniques such as pollution prevention requirements, or extended compliance times for sources seeking innovative technologies; nonetheless, enforcement should serve as a backbone to regulatory efforts. As State environmental

agencies consider market-based regulatory approaches, they need to ensure there is no "back door" for sources to slip through. Enforcement can also be linked to another strong motivator for firms - - the public, if enforcement actions are made public.

One of the ways enforcement actions serve as an incentive to firms is it can focus the attention of upper management on environmental issues. As one survey respondent stated, "Nothing gets the attention of upper management like an enforcement action." Enforcement actions can initiate a chain reaction in firms and can be an important motivator to move firms out of the "investigative" stages to "implementation" stages for prevention or control of pollution. It sends a strong message as to the agency's commitment to pollution prevention and control. Some firms have reported (April, 1997) that if it wasn't for government-imposed taxes and subsequent enforcement actions related to Chlorofluorocarbons (CFC's), they would have continued its use. Other companies' bad compliance records can motivate them to stay ahead of the regulatory curve to avoid future enforcement actions.

State environmental agencies are encouraged, to the extent possible, to pursue enforcement actions, and to incorporate innovative pollution prevention and pollution control strategies as part of the action.

Recommendation#2: Use financial factors as an incentive

Clearly economic considerations are of paramount importance to most firms. Financial issues affect every aspect of a firm and form the basis of key business decisions. Environmental regulations affect a firm's financial resources in terms of equipment choices, operational decisions, and direct and indirect compliance costs. The financial consequence of complying with environmental regulations can be both an incentive and disincentive to environmental performance.

The incentive is for firms to reduce their compliance costs: raw materials, recovery of valuable materials, utility costs, permit fees and other compliance costs. The disincentive financial issues represent are capital costs for pollution control equipment, uncertain economic benefits for unconventional technologies, long payoff periods for future cost savings, and costly downtimes for required equipment retrofits. The unavailability of capital which may be especially true for firms with small profit margins, can prevent firms from improving their environmental practices. It may also prevent firms from implementing changes in their operation with good payoff potential. Firms with tight cashflows and low equity values for their facilities may find capital difficult to obtain. Lenders look for stability and profitability. Firms with small profit margins, in particular, need economic certainty before trying innovative technologies. Any technology considered by any firm must exceed their average rate of return on equity.

The impact of the cost of regulatory compliance often depends on firm size and profitability. Small firms obviously do not have the financial flexibility of most large firms. Typically they have fewer

resources, less technical expertise and are not advantaged by things such as economies of scale. R & D costs for new technologies and processes may be prohibitive for smaller firms and complex environmental management systems and total cost accounting may not be practical for these firms. The implication to regulators is to understand the different pressures and incentives and disincentives that fall along firm size, when targeting firms for different regulatory initiatives.

Fees as motivators

It is recommended that State environmental agencies maintain the current fee structure that exists for air quality sources. This is despite increased pressures by industry to reduce or eliminate certain fees. The command and control system admittedly has administrative features that could be streamlined to save both the agency and firms financial resources. However, one reason command and control approaches continue to be the backbone of regulatory programs may be they are less of a drain to agencies, with a few exceptions, than more flexible market-based approaches. Market-based systems demand more agency resources. If firms want flexibility in implementing regulatory requirements, the minimum requirement recommended is fees. In addition, state agencies are obligated under the Clean Air Act to maintain fully supporting programs such as Title V operating permits.

The second reason to maintain current fee structures is to take advantage of the continued economic incentive for firms to reduce their emissions. While not all firms seek to optimize returns, it is assumed that most firms do; therefore economic incentives are an important part

of any regulatory approach. Linking fees to emission levels may be an important incentive for some firms to reduce their pollution. Clearly this is not universally true, especially for very profitable firms or for firms who feel compliance costs outweigh the risk of enforcement actions. Linking industry fees to the amount of pollution generated addresses the failure of the market to internalize the costs of environmental pollution. By internalizing the costs of pollution, regulatory agencies theoretically serve as a protection of resources commonly held. Making emission fees a function of improved production efficiency introduces a positive profit incentive for firms.

Expand use of market-based regulatory "tools" to help firms overcome financial disincentive to environmental performance

Sources of air pollution in Oregon are currently restricted in their use of certain market-based "tools" such as bubbling and emissions trading. Bubbling allows firms to average emissions while emissions trading allows firms to "buy" emission reductions from external firms to meet regulatory requirements. Use of these tools is restricted for a variety of reasons. Federal requirements prohibit use of bubbling to meet "RACT" (Reasonably Achievable Control Technology) to ensure firms are meeting current technology standards. Compliance demonstrations while not impossible, can be more difficult under these strategies. Finally, bubbling and emissions trading require additional agency resources to administer. If these issues can be overcome, it is recommended State environmental agencies expand the use of these and other market-incentive tools to allow firm's flexibility in seeking cost-effective solutions to environmental problems.

A note of caution is warranted in that allowing firms to seek cost-effective solutions to compliance problems may not necessarily ensure continued technological improvement. Market-incentives must be coupled with technological requirements when old technologies are replaced by more efficient technologies. This can be accomplished by requiring retrofits or equipment replacements when firms exceed certain emission thresholds. This ensures the airshed will continually improve as existing firms expand, or as new firms enter the area.

An example of how bubbling can help firms overcome financial constraints related to environmental compliance is a firm, for example, that operates two coating lines that emit volatile organic compounds (VOC). If the standard is 3.5 lb VOC/gallon of coating, bubbling would allow this firm to overcontrol the most cost-effective line, while undercontrolling the other line, as long as the average emissions from both lines do not exceed 3.5 lb VOC/gallon of coating. Bubbling could have significance to firms who have military contracts for instance, that specify use of certain coatings which may result in emissions that exceed current standards.

Firms may be able to overcome financial barriers to environmental performance through emissions trading. Expanding the use of emissions trading would in effect allow the market to seek out the lowest cost emission reductions "for sale" for firms to meet regulatory requirements.

Pre-approved permit changes may also help some firms who meet minimum criteria such as compliance record and compliance demonstration capabilities, overcome economic barriers related to environmental requirements. This might be a strong incentive for quick-

to-market firms such as high technology or pharmaceutical companies. This market-incentive might be offered in exchange for overcompliance.

Recommendation#3: Use technical assistance wherever possible

Technical assistance can also help firms to overcome economic barriers related to environmental performance. Environmental agencies can offer technical assistance focusing on waste minimization, pollution prevention opportunities, user-friendly cost accounting systems, waste audits and regulatory requirements checklists. Technical assistance can be a powerful tool in helping firms reduce costs.

A hazardous waste generator assistance program conducted by the Oregon Department of Environmental Quality involving 139 firms resulted in significant improvements in hazardous waste reduction. Sixty-five percent of the facilities visited made major improvements. Among this program's findings was that proactive targeting can be a major contributor to increased compliance, pollution prevention and waste reduction. It also found that proactive technical assistance can achieve a high level of acceptance within the regulated community. One of the key successes of this program was a simplified one-page "Action Form" filled out by the facility that outlined hazardous waste determination needs, other generator waste management requirements and waste reduction recommendations. The high level of participation in using this form which resulted in significant hazardous waste improvements was attributed to the form's simplicity and the agency's follow up and cooperative attitude. The effects of technical assistance efforts is well documented and should be a continued part of the State

environmental agencies' efforts to help firms overcome economic barriers to perform.

Recommendation#4: Use a combination of flexibility and certainty in regulatory strategies

Implementation flexibility is an important incentive for firms as they seek to adapt regulatory requirements to their facility. One of the assertions of this study was that the current prescriptive, one-size-fits-all regulatory approach is resulting in diminished environmental returns. This approach does not address differences in firms related to their resources, priorities, operational differences, profit margins, operating costs and incentives and disincentives which may cause firms to vary in their response to regulatory initiatives.

The need to consider alternative regulatory approaches is exemplified by pollution control costs that are beginning to outpace environmental gains. Efforts to achieve continued compliance with environmental goals can be facilitated by incorporating certain flexible components to the overall regulatory approach such as extending compliance deadlines for firms adopting innovative technologies, and use of certain market-based regulatory tools which was discussed in a previous section.

Supplemental Environmental Projects (SEP) are an example of a flexible compliance mechanism. The Oregon Department of Environmental Quality is encouraged to continue its use of SEP's in addition to considering other innovative compliance mechanisms that allow firms to participate in their compliance demonstration. SEP's allow

firms to mitigate civil penalties in exchange for implementing environmental projects such as pollution prevention. SEP's are looked upon most favorably when a firm has self-reported a violation and has shown a willingness to correct the violation in a timely manner. SEP's are typically most appropriate for first-time violators rather than firms with long compliance records. Penalties for violations that were willfully ignored or have a criminal component are not eligible for SEP's. A firm can use an approved SEP to mitigate up to 80 percent of the penalty through pollution prevention or other methods or preventing or reducing the pollutant(s) involved in the violation.

Agencies are also encouraged to offer extended compliance times especially when firms are implementing uncertain technologies in an attempt to comply with a standard. This may be true not only for innovative technologies, but for some "off the shelf" technologies. Technical uncertainties associated with changing to an unfamiliar process coupled with the need to meet an emission limit within a certain time frame can be an overwhelming disincentive to firms who need some measure of certainty to avoid the risk of noncompliance.

Incorporating pollution prevention requirements into enforcement actions is another example of offering firms flexible compliance mechanisms. However, most firms prefer certainty and opt to just pay a fine and go back to business as compared to trying pollution prevention which may lead to uncertain results. Pollution prevention has a higher burden of proof than conventional end-of-pipe technologies which may explain why some firms will not adopt it. Despite this limitation, whether a firm adopts a conventional end-of-pipe technology or a more market-

driven technological approach is highly influenced by the cooperation of the agency and the flexibility of compliance mechanisms.

Recommendation#5: Use inspectors as key players in developing cooperative relationships between firms and the agency

Inspectors play an important role in developing a cooperative relationship between the firm and the environmental agency. They can be the firm's first line of communication to the regulated entity. Inspectors can develop ongoing relationships with facilities working with them to achieve compliance.

The opportunity for an environmental agency inspector to develop such a relationship with firms depends on a number of things: the environmental program (e.g. degree of self-reporting), agency funding priorities, number of firms regulated by program (e.g. frequency of inspections), complexity of the program (e.g. need for inspections), personalities of the inspector and staff at the firm, and of course willingness of the firm to exercise the option of an agency inspection. There are variations between environmental programs that lead to different compliance needs for both the firm and the agency. Title V is an example of how compliance needs change for the agency and for firms.

Title V is an operating permit program which was one of the major outcomes of the 1990 Clean Air Act Amendments required of all states. Title V is unquestionably the most comprehensive air quality regulation promulgated in years. Title V organizes all the air quality obligations of a "major" source (emit/potential to emit > 100 tpy of any regulated pollutant) into one permit. With the exception of hazardous air pollutants, the Title V operating permit program does not require any

stricter standards. However, it does require a greater responsibility for firms to monitor, report and to certify compliance with the conditions of the permit. Another new feature under Title V is firms must report on compliance every 6 months. A designated representative of the firm must certify compliance and if found to be in noncompliance, could be imprisoned for up to 5 years with fines reaching $250,000. Approximately 200 firms in Oregon are subject to Title V requirements.

The impact of Title V is a significant workload increase to the agency in helping firms compile data, reviewing old source test data for sufficiency, requiring new source test data, and analyzing monitoring, recordkeeping, reporting and other information to ensure compliance. Each Title V permit can take one permit writer up to 2 years to process.

The inspector's role with regard to Title V needs to be one of flexibility considering the "wide net" Title V cast which includes firms that were unaware parts of their operations were subject to this new requirement.

Air quality inspectors may have the opportunity to develop closer relationships with the firms they are responsible for, than hazardous waste inspectors for instance. This is because hazardous waste inspections can be very time consuming when compared to air quality inspections, which means fewer inspections due to resource constraints. In addition, the universe of hazardous waste firms is much larger than for air quality firms. This means the turnover rate for hazardous waste inspections is much slower than air quality inspections. What this means is that air quality inspectors have a unique opportunity to develop

closer relationships with firms, to understand their compliance needs and the affect environmental outcomes.

The program (hazardous waste versus air quality) may set the tone for the relationship between regulated and regulator. RCRA (Resource Conservation and Recovery Act) which governs hazardous waste sources, is reported as "pickier" when it comes to paper trails, for instance, than the Clean Air Act. In fact, most RCRA violations are reported to be paper violations. On the other hand, hazardous waste violations might be easier to spot than air quality violations since spilled drums are easier to pick out than an "invisible" air emission.

Notwithstanding a temporary increase in air quality violations immediately following the introduction of Title V, in recent years there generally have been more hazardous waste violations than air quality violations. But many factors account for the disparity: funding differences between programs, ratio of inspectors to regulated sources; number of "enforceable" actions in one program over another; and degree of self-reporting. The relationship between the inspector and the facility is one of many factors influencing a firm's environmental performance.

The importance of the State environmental agency continuing inspections for both enforcement and non-enforcement purposes is very important in influencing firm environmental performance. Inspections are especially critical to small to medium firms who have limited resources. These firms may rely on outside sources for technical expertise. Agency inspectors can help these firms overcome technical barriers. In addition, overcoming communication barriers between a government agency, with its own language, perspective, and priorities,

and a firm which operates in the market with its own set of priorities and language. Clearly, this intersection between firm and agency represents a multitude of problems when attempting to initiate a regulation. Some smaller shops have workers with a high school education. Agency inspectors describing "potential to emit" may mean nothing to these workers who are focused on production needs. What might make more sense is talking about emissions in terms of "gallons of coating" used. Learning to speak a similar language can help overcome misunderstandings about regulatory requirements.

Aqueous parts cleaners are an example of how technical assistance can be used in concert with regulatory requirements to achieve environmental goals. Seven years ago aqueous parts cleaners were fairly new and used only by adventurous firms. Today with the phase-out of ozone depletors and a growing regulatory discouragement for use of chlorinated solvents, aqueous solutions are used in conservative firms. But this shift may not have taken place without the technical outreach of environmental agencies. Agency inspectors can fill a crucial gap in providing firms technical information and in promoting certain waste management hierarchies such as EPA's reduce, reuse, recycle.

Environmental agencies are encouraged to make inspections and trained inspectors a high priority since firm-agency relationships are critical to continued environmental performance.

Recommendation#6: Use a "common sense" approach to interpretation/implementation of regulations

State environmental agencies can improve their approach to interpreting and implementing regulatory requirements. Staff at environmental agencies may interpret regulations in a strict sense overlooking a common sense approach which questions the intent of the requirement. State environmental agencies have some constraint in interpreting and implementing regulations due to federal oversight. Where flexibility exists, the recommendation is for staff at these agencies to question the discernible environmental benefit of regulatory interpretation and implementation decisions. Rulewriters, permit writers, inspectors and management at state environmental agencies affect how firms will comply with regulatory requirements. Adopting more of a common sense approach to writing, interpreting and applying regulations may improve environmental outcomes as it may provide increased implementation flexibility for firms along with regulatory certainty when requirements are consistently applied.

An example of using a common sense approach to interpreting and implementing regulatory requirements has to do with the concept of "potential to emit" The definition of potential to emit as found in Oregon Administrative Rules 340-028-0110 is "...the maximum capacity of a stationary source to emit any air pollutant under its physical and operational design." Calculation of a potential to emit includes an assumption (based on maximum capacity of the facility) that the facility is operating 8760 hours/year, 365 days/year, with all shifts in operation. If strictly applied, this would mean small gas stations would be subject to requirements meant for larger sources. Clearly gas stations and other facilities have obvious limitations to their operations. If a gas station has

twenty pumps, it would be a physical impossibility to assume cars would occupy all pumps at the same time, and the station would pump gas 24 hours a day. A more common sense approach would tell us there are operational limitations that should be accounted for when determining applicability to certain regulatory requirements.

Another example of taking a common sense approach to regulations is a facility with a natural gas boiler with fuel oil used as a backup in the event of curtailments or maintenance. Assuming the boiler is used just for heating, a realistic approach would be to assume the boiler would heat just the surrounding area, and would be in operation five or six months of the year. But a strict interpretation would be based on the facility operating this equipment at maximum capacity: 8760 hours a year, 12 months and so on. These are two examples of many opportunities environmental agencies have for taking a realistic approach to regulating firms.

Providing firms with regulatory certainty is another key factor in getting firms to adopt environmental goals. One way agencies can provide firms with regulatory certainty is to involve firms to participate in proposed regulatory actions. Another way is to provide clear, measurable environmental goals. A third way is to offer, where possible, economic justification of requirements. For instance, a requirement that costs firms $500,000 a year to administer might not pass the economic justification test where it might make better economic sense to direct a portion of those costs to actual pollution control. If firms cannot see the economic justification of a requirement, the environmental goal may not be fully adopted. Hollow paperwork exercises shift valuable resources

away from bottom line environmental results, both for the agency and firms, and they minimize the credibility of the environmental objective.

Finally, agencies that attempt to write clear rules, and seek to improve consistency in terms of intepretation and implementation will improve regulatory certainty for firms which may help to enhance their their environmental performance. These are lofty goals for state environmental agencies with dwindling budgets, marginalized political power and a diffuse staff which makes consistency difficult if not impossible, but improvements can be made.

Recommendation#7: Encourage the public to assess their influence on environmental compliance by firms

Firms vary in their response and sensitivity to public pressure which may depend on the interface between their products and processes and the public. Not all firms are influenced by public scrutiny. All parts of the study revealed that many firms are influenced by the public. Whether through market choices in their products, or in influencing process decisions. The example of a significant abnormal negative stock devaluation of many firms immediately following disclosure of their Toxic Release Inventory data required under Superfund was discussed in the literature review section. 1986 was the last year, as part of the Superfund requirement, that air polluters were publicly required to disclose their emission levels.

The majority of rule development, interpretation and implementation is predominated by large industrial sources and their attorneys, industry lobbyists and associations. Industry unquestionably

has more influence on the regulatory process as with the legislative process than any other stakeholder.

Because state environmental agencies currently have weakened political power in Oregon, it is recommended that the agency not be directly involved in using the public as a quasi-regulatory tool. Instead, it is recommended the state environmental agency make use of a third-party to initiate such actions. Sierra Club, or other environmental groups or public interest groups could search agency records for a list of the top polluters and could have the local newspapers print the information, which has been done in past years. Surprising little public involvement takes place at the state environmental agency save a few minor showings at truely controversial hearings where newspaper headlines have drawn public interest.

Risking industry revolt, state environmental agencies could seek to develop more public involvement in governing environmentally regulated entities. This could be done by inviting interested public members to sit on advisory committees when discussing proposed rule language, to get involved in environmental assistance projects in concert with other regulatory agencies, to work with the agency on neighborhood projects such as developing "Good Neighbor Agreements" with industrial sources of hazardous air pollutants, and by participating in expanded public review of permit actions in exchange for more flexibility offered to firms in certain permit exemptions. Enforcement and compliance actions can also have more public involvement components. In addition, agencies can do more public outreach efforts working with school-age children in beginning to shape their perception of environmental issues.

Any recommendation to involve the public in regulated industrial sources is tempered by the agency's politically compromised position; However, to the extent possible, State environmental agencies are encouraged to consider utilizing market forces such as the public to apply pressure to firms to influence their environmental performance.

Recommendations for Further Study

This study examined global incentives and disincentives of organizations, such as protecting profitability from external pressures such as regulatory demands and the influence of the public on firm behavior. It is recommended that additional studies examine how incentives and disincentives drive business practices on a local level (e.g., how incentives and pressures affect operating decisions; how marketing measures its performance versus production).

Another area deserving further study is an examination of the reasons for noncompliance (e.g., production inefficiencies, how the firm is structured - - are there links between those responsible for environmental performance and the policy initiative?). An evaluation of key activities that lead to poor environmental performance could be included.

A study could be conducted to determine the association between regulatory tools and emission reductions. This would be an evaluation of the extent to which a given regulatory tool (e.g., technical assistance) is associated with an increased tendency to prevent pollution. These

studies can improve the understanding of both the causal links and the relative impacts of regulatory tools.

Finally, patterns to variation of firm response to different regulatory initiatives tools could be identified. An assessment of the prevalence of these different responses to different motivating factors conducted of a large sample to eliminate sample bias would be informative.

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APPENDICES

Appendix A

Survey Instrument

I. Policy Directives

A. Corporate Environmental Policy

1. Do you have a Corporate Environmental Policy? (IF NO SKIP TO NEXT SECTION)

2. How long have you had the policy?

3. Why was it developed (e.g. environ crises, public pressure, etc.)

4. What part of the organization was the primary author?

5. Who contributed to the policy, and what was the process of involvement?

6. Is the policy the same for all facilities?

7. Does the policy really guide decisions at a facility level?

8. Does the policy change behavior? How?

9. How would things be different without the policy?

10. What effect does the policy have on compliance with regulations?

11. Who has primary responsibility for insuring goals of the policy are carried out?

12. Do you feel management (company-wide) is committed to the policy?

13. Do you feel management (facility-wide) is committed to the policy?

14. How important is a company-wide commitment to the policy, in terms of achieving environmental goals?

Appendix A (Continued)

Survey Instrument

15. How important is a facility-wide commitment to the policy, in terms of achieving enviromental goals?

16. Who do you feel has a greater impact on making sure environmental goals are met: corporate or facility staff?

II. Measurement and Tracking of Environmental Practices

A. Facility-Wide Measurement of Environmental Performance

1. How is environmental performance measured at your facility? At the corporate level?

2. IF MEASUREMENT DIFFERENT: Does this difference affect environmental performance?

3. Is there a contingency plan if any of the environmental objectives are not met?

4. How is enviromental performance tracked?

5. How much effort is spent on tracking environmental performance? (frequency of reporting, etc.)

6. How would you rank your overall environmental performance?

7. How do you know when you are out of compliance with regulations?

III. Training and Regulations

1. How is staff trained on environmental directives?

2. How do you find out about new regulations?

Appendix A (Continued)

Survey Instrument

3. How do you get trained on new regulations?

4. What affect does training of regulations have on environmental performance?

5. What does having a reliable source to contact with questions about regulations have on environmental performance?

6. How comprehensible (in general) are most air regulations?

7. What affect does how easy regulations are to understand have on environmental performance?

IV. Relationship with Environmental Agency

1. Do you know who to contact at the state agency for questions about regulations?

2. Do you think technical assistance offered by the state agency affects environmental performance?

3. Are you involved with rule development with the state agency? SKIP TO #5 IF NO.

4. IF YES: Does early involvement in rule development make a difference in your firm's environmental performance?

5. How would you rate your relationship with the state agency?

6. Do you find the state agency to be responsive?

7. How could your relationship with the state agency be improved?

8. How does your working relationship with the state agency affect your firm's environmental performance?

Appendix A (Continued)

Survey Instrument

V. Resource Allocation to Environmental Management

1. How many full time staff are involved in environmental management at your facility? Company wide?

2. Any idea what percentage of total facility budget is devoted to environmental management (direct/indirect costs).

3. Is job performance linked to environmental performance?

4. IF NO: Should it be? Would it make a difference on environmental performance?

VI. Impact of Public on Firm Behavior

1. How close is your facility to a residential area?

2. How close are you to other industrial sources of air pollution?

3. Any idea how many public complaints your facility receives a year? Type of complaints?

4. What does your firm do in response to most public complaints?

5. How important is public perception of your facility?

6. Does the public influence your environmental practices?

Appendix A (Continued)

Survey Instrument

PLEASE RANK THE FOLLOWING IN TERMS OF IMPORTANCE TO ENVIRONMENTAL PERFORMANCE (1 being low; 10 being high)

Internal Factors

1. Corporate Environmental Policy
2. Upper management commitment to policy
3. Other management commitment to policy
4. Hourly staff commitment to policy
5. Consistent application of policy

6. Training on Corporate Environmental Policy
7. Training on regulations by *company staff*
8. Training on regulations by *regulatory agency*
9. Training on regulations by *industry organization*
10. Technical assistance by *company staff*
11. Technical assistance by *regulatory agency*
12. Technical assistance by *industry organization*

13. Environmental performance tracking
14. Compensation linked to environmental performance
15. Adequate financial resources allocated to environmental management
16. Adequate human resources allocated to environmental management

External Factors

17. Regulations (clarity)
18. Regulations (administrative requirements; does this have a negative effect on performance)
19. Relationship with regulatory agency

20. Public influence

Appendix B

Informed Consent Read To Respondents

I am an Oregon State University student working on a thesis that involves researching industrial sources of air pollution. I need your help to determine factors that affect the environmental performance of major industrial sources of air pollution. Do you have a few minutes right now for me to give you an overview of what this is about?

Your participation will involve two telephone conversations **[or one interview in-person]**, more if needed, although it is not anticipated, with each conversation lasting approximately 45 minutes **[approximately two hours for one interview in-person. 30 minutes if a follow up interview, telephone or in-person, is necessary. Location for the in-person interview is whatever is convenient for you]**. It may also involve faxing to you in advance, an outline of the areas our conversation will cover, or additional information, as needed. I am happy to schedule these interviews at your convenience, and if we get interrupted and either of us need to return to work, I would be glad to reschedule.

Your participation is completely voluntary and you may discontinue participation at any time; however, your participation is very important, and is greatly appreciated. Although I am a public employee of a state agency, I am conducting this survey as a University student and any information you share is held confidential, and the name of your company will not be identified. If you have questions about this study at any time, you may contact my major professor, Kenneth Williamson at 541-737-6836. If you do decide to contact Dr. Williamson, I'd remind you do not need to reveal your identity, just that you are part of my thesis work.

The benefits that are anticipated from this work include a better understanding of how major industrial sources of air pollution make decisions that ultimately affect environmental performance. The results may help businesses, such as yours, to understand what factors, internal and external, are important to the operation of the business and how those factors affect environmental compliance. This understanding could help to redirect resources.

Appendix B (Continued)

Informed Consent Read To Respondents

It may also stimulate new thinking about alternative approaches to environmental compliance based on the most important factors identified. In other words, if operational flexibility is very important, is there a way to preserve operational flexibility while still meeting regulatory requirements? EPA and state agencies are receptive to hearing about innovative approaches that both preserve what is important to business, while achieving environmental objectives.

This information could also benefit state agencies to focus their efforts when it comes to choosing policy instruments that align with what motivates regulated sources of air pollution. Finally, it is hoped this work will give environmental rulewriters, state and federal, new insights into what motivates business, which should be useful when they develop policy instruments, since they are attempting to change behavior.

Thank you for your time. I hope you will be willing to participate, and if so, I would like to schedule the telephone interviews **[in-person interview]** as soon as your schedule allows, since my thesis needs to be completed this summer. Do you have any questions?

Appendix C

Interview Participants

Informal interviews were conducted on the telephone and in person with city, state and federal environmental agency staff, consultants, staff in academe, energy alliance organization staff, and an industry representative. These discussions were conducted to determine what factors were important to firms when adapting to external pressures such as environmental regulations. Alternative regulatory approaches currently implemented in the State of Oregon were also discussed as were compliance and enforcement practices for traditional regulatory strategies.

Information from these interviews was used as background material to be combined with the survey results and literature search in developing the recommendation for this study.

The following individuals participated in these interviews:

Consultants:

Rob Greenwood, Martha Prothro, Ross & Associates, Seattle, WA
Janet Gillespie, Environmental Strategies, Portland, OR
Ted Jones, Alliance to Save Energy, Washington, DC

Academe:

Dr. Craig Shinn, Portland State University, Public Administration, Portland, OR
Greg Wheeler, Oregon State University, Industrial Assessment Center, Corvallis, OR

Federal Environmental Agency:

Walt Stevenson, US EPA, Research Triangle Park, North Carolina
Fred Dimmick, US EPA, Research Triangle Park, North Carolina

Appendix C (Continued)

Interview Participants

State Environmental Agency:

All of the following are staff at the Oregon Department of Environmental Quality:

Sandy Gurkewitz, Pollution Prevention, Portland, OR
Nancy Couch, Enforcement and Compliance, Portland, OR
Bart Collinsworth, Hazardous Waste, Salem, OR
Kevin Masterson, Hazardous Waste, Portland, OR
Les Carlough, Enforcement and Compliance, Portland, OR
Sarah Armitage, Air Quality, Portland, OR
Marianne Fitzgerald, Air Quality, Portland, OR
David Rozelle, Toxic Use Reduction, Salem, OR
Jim Villendre, Hazardous Waste, Portland, OR
George Davis, Air Quality, Portland, OR
Holly Shroeder, Green Permits Program, Portland, OR
Larry Schurr, Hazardous Waste, Portland, OR
Larry Cwick, Enforcement and Compliance, Portland, OR
Nina DeConcini, Air Quality, Portland, OR

City Agency:

Margaret Reich, City of Portland, Bureau of Environmental Services

Industry:

David Berg, Simpson Timber Company, Portland, OR

Table 1
Regulatory Tools Assessment Criteria

EPA/State Implementation Plan Requirements (SIP)

Clean Air Act Amendments
Federal rules; guidance
EPA Region 10 policy
Attainment/Maintenance Plan SIP submittals

Air Quality and Cross Media Impacts

Incentives for voluntary, early reductions
Net air quality benefit
Real, actual reductions versus paper reductions
Avoid double counting reductions
Protect benefit of natural turnover
Attainment/Maintenance Plan SIP submittals
Health and welfare impacts
Cross media impacts

Industry Impact

Cost effectiveness of compliance
Operational flexibility
Practical implementation
Growth in nonattainment area
Timeliness of processing
ROI on control investments
Impact on employment
Provide regulatory certainty
Adaptable to technology changes
Encourage technological innovation

Table 1 (Continued)

Regulatory Tools Assessment Criteria

Environmental Agency Staff Impacts

Processing/review time
Number of actions requiring review
Progam cost
Complexity of implementation
Training requirements
Impact on workload: re-prioritization

Table 2

Effectiveness of Regulatory Tools in Addressing Competing Interests

Environmental Results

1. Design standards

Reliable in assuring environmental results; but most heavily criticized as restricting industry choice. Administratively burdensome to industry and agency.

2. Performance-based standards

Fairly reliable environmental results; some performance uncertainty due to unspecified control technology, which could be addressed by compliance assurance factors established in permits.

3. Emissions Trading

Critics argue there are quantification problems. Proponents say the improved flexibility will lead to reductions that will outweigh quantification uncertanties. Improved monitoring capabilities at sources could improve compliance assurance. Also, requirement for additional reductions in exchange for flexibility could improve use of this instrument.

4. Mandatory Public Disclosures

May lead to emission reductions depending on firm response to public pressure. May have limited application both in terms of its effect on emission reductions and who administers (e.g., studies found disclosures that were expected by the market had little or no effect in firm behavior; third-party, not agency should initate to relieve agency of political pressure, unless under agency enforcement action).

5. Technical Assistance

May lead to emission reductions.

Table 2 (Continued)

Effectiveness of Regulatory Tools in Addressing Competing Interests

6. Pollution Prevention

May lead to emission reductions. One study conducted by Ross & Associates (1995) suggested the evidence was very strong that pollution prevention "planning" resulted in more and quicker reductions in hazardous substance use and hazardous waste generation than would have occurred without pollution prevention efforts.

Industry Impacts

1. Design Standards

Cited as least cost-effective policy choice. May restrict industry choice in control technology.

2. Performance-Based standards

Provides more industry flexibility than design standards. But, as noted above, may result in less certain environmental results when compared to other policy tools unless compliance assurance is specifically addressed under enforceable conditions in permits.

3. Emissions Trading

One of more cost-effective policy choices since industry can choose what emitting units are most cost-effective to produce emission reductions.

4. Mandatory Public Disclosure

Impact to industry can be significant as noted in studies on stock value drops after Toxic Release Inventory disclosures. However, can be cost-effective as sources can choose where, or if to reduce emissions as result of public pressure.

Table 2 (Continued)

Effectiveness of Regulatory Tools in Addressing Competing Interests

5. Technical Assistance

Cost-effective. Very flexible regulatory tool.

6. Pollution Prevention

Can be cost-effective. Flexible regulatory tool.

Agency Demands

1. Design Standards

Heavy administrative burden, but, standards easier to set under this approach than performance-based. Reliable outcome.

2. Performance-Based standards

Can result in additional administrative burden as agency needs to confirm source control-choice capable of meeting standards.

3. Emissions Trading

Can result in additional administrative burden as agencies have to establish compliance assurance for two sources involved in trade, instead of one source under another policy approach. Resource-intensive to quantify reduction, and continue compliance assurance for two sources throughout life of trade (necessitates maintaining records on both sources for several years, coordination of permits, etc.). But increased reductions resulting from allowing firms flexibility in trading may offset agency impacts.

4. Mandatory Public Disclosure

Little agency demand. This regulatory tool would shift most of the implementation demand from agency to industry.

Table 2 (Continued)

Effectiveness of Regulatory Tools in Addressing Competing Interests

5. Technical Assistance

Can be very resource-intensive but there is strong evidence that increased technical assistance improves environmental compliance.

6. Pollution Prevention

See Technical Assistance above.